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Army-Baylor Graduate Program in Health and Business Administration

A Proposed Conceptual Model of Military Medical Readiness

Graduate Management Project

Submitted to Lieutenant Colonel M. Nicholas Coppola, MSA, MHA, PhD, FACHE

In partial fulfillment of the requirements for Degrees in Health and Business Administration

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Abstract

No single *accepted* definition or uniform framework has ever been offered or suggested defining medical readiness within the Department of Defense. The purpose of this research is to consolidate existing literature on the latent variable of medical readiness, and to propose a composite theoretical model of medical readiness that may provide healthcare professionals a common operating picture for understanding and improving medical readiness. The basis for the proposed conceptual model builds on common and accepted latent variable and theoretical modeling techniques proposed by healthcare scholars, organizational theorists, mathematical methodologists and military leaders. It is the intent of the author that this framework might act as a foundation in describing and presenting future discussion on military medical readiness.

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Introduction

Purpose

The purpose of this paper is to explore the construct of military medical readiness and develop a model to conceptualize military medical readiness for the United States Department of Defense. The study examines differing definitions of medical readiness, key components, and relationships between components. The aim is to detect and understand key components of medical readiness and synthesize discovered themes into a conceptual model for evaluation. This paper is prepared for all stakeholders in military medicine to stimulate discussion and further research to understand military medical readiness. At a broader level, the paper may contribute to advancing thematic analysis and conceptual modeling as acceptable qualitative methods in healthcare. The format of this paper is constructed to provide the reader with an introduction to military medicine, conditions prompting the research, and background information to develop an appreciation for the nature of this study. Later sections provide the reader with sufficient information about qualitative research, theory, content analysis, and modeling to appreciate the research findings, results, discussion, and recommendations.

Problem Statement and Research Question

The literature review suggests the dilemma of discussing and defining medical readiness has existed in the Department of Defense for several decades. Regardless of progressive attempts to define medical readiness, military dictionaries and glossaries do not currently offer a formal definition for medical readiness that is recognized across the Department of Defense (DOD). It is therefore likely that this paper is one of the first to offer a possible conceptual framework for discussing medical readiness. Despite stakeholder agreement that medical readiness is crucial for success, defining medical readiness has proven to be a difficult endeavor. In a 1997 article

discussing U.S. Navy fleet medical readiness, Smith and Petersen (1997) express frustration, reporting:

In today's Navy, unfortunately, fleet medical support doctrine remains insufficiently defined, inadequately validated, and not specifically integrated in to the 'Lines' warfighting concepts of operations. These limitations render it difficult to define requirements for medical readiness in the fleet. Furthermore, such ill-defined readiness goals prevent the setting of standards for measuring or reporting progress....Such absence of command oversight and input has resulted in differing interpretations of fleet medical readiness and has produced uneven priorities in preparing for the medical support of the littoral warfighting strategy.

Smith and Petersen's account echoes other military leaders concerns and demands for a common foundation for describing and discussing medical readiness to increase the effectiveness of the military medical force. Kuhne (2005) warns about the inherent difficulties and importance of common definitions:

Unless a community arrives at an agreement on its basic terms its communication will be plagued by misunderstandings both noticed and unnoticed. Without a shared conceptualization, the different ontologies used by different members may potentially create the illusion of agreement where is none and raise barriers of communication where they are just accidental. (p. 1)

Just as Kuhne cautioned, this lack of symmetry of information often creates individualized and unique interpretations of medical readiness standards that vary widely between Services and healthcare leaders. As a result, the exact definition of medical readiness depends on who is doing the defining causing Services to have widely varying skills, knowledge,

and levels of preparedness. Due to different experiences, perceptions, heuristics, enemies, threats, and missions healthcare leaders are making individual interpretations from the plethora of existing Service-specific policy memoranda, other written guidance, traditions, and limited archived information (Coppola, Cuyler & McMahon, 2005). An example of this phenomenon are the widely differing issues, critiques, and suggestions, voluntarily submitted by military members to the Army Medical Department Center and School (AMEDDC&S) Lessons Learned repository. Aimed at improving military medical readiness, as of January 26, 2007, the AMEDD has received 6,585 observations and estimates these observations have 10,494 implications on medical readiness (Army Medical Department, 2007). Of these observations over 3,800 are considered specific to improving medical readiness and resources in support of Operation Iraqi Freedom.

Joint Vision 2020 (OSD, 2004) provides the overarching guidance to synchronize the efforts of each Service in doctrine, organizational design, training, capabilities, and requirements for future operations. In a resource-constrained environment, Joint Vision 2020 maximizes the individual Service contribution, leverages technology, and channels human vitality and innovation to effectively accomplish the joint mission. Despite this guidance, the members of the U.S. Army, U.S. Air Force, U.S. Navy and Federal agencies maintain unique partisan opinions regarding how medical readiness is explained and measured (Coppola, Cuyler & McMahon, 2005). The lack of a uniform understanding of medical readiness, how it is communicated, and how requirements are achieved results in a recursive process of defining and applying readiness concepts with compartmentalized archival of best practices and knowledge management. Coppola et al. assert this process may actually decrease “readiness” as individual Services

constantly redefine, reapply and potentially misinterpret requirements necessary to make individuals and units truly prepared to protect and defend the Constitution.

Despite the lack of a uniform definition, *medical readiness* is a term widely used and often cited in daily operations and doctrine within the DOD. The author suggests that the absence of a shared definition across the Uniformed Services has contributed to confusion, redundancies, and uncertainty in the Military Health System (MHS). Understanding that creating and maintaining readiness requires resources, the author suggests that a common picture of medical readiness for all Services to pursue will improve the allocation of resources. Evidence suggests that a shared mental model may increase organizational performance (Mohammed, Klimoski & Rentsch, 2000). The Joint Staff (2000) appears to agree with this assertion in its statement, “Joint concepts... provide a basis for the development of future joint forces, and assist the Services in developing their future forces for joint, multi-national, and inter-agency operations” (p. VIII-5).

To reduce ambiguity and hopefully improve the effectiveness and efficiency of the Military Health System, this study attempts to primarily answer, “What is medical readiness?” What does medical readiness mean? How would leaders describe medical readiness? The following ancillary questions may provide valuable insight into answering the primary question. What are the components of medical readiness? What results should it produce? Should it produce results? Is it the health of a Service Member? Does it include care to family members? Does it include capabilities to care for detainees? What knowledge, skills, and abilities does it encompass? Should we be ready to provide humanitarian and civic assistance? Are we responsible for responding to disasters, national and international? In the absence of a formal, universally understood definition, this study conducts a document analysis to uncover key determinants of medical readiness.

Background

The Department of Defense operates one of the largest and most complex health care organizations in the nation (Hosek & Cecchine, 2001). As of 2005, the Military Health System reported operating about 361 fixed medical treatment facilities, including 52 hospitals and 309 clinics (TRICARE, 2006, p. 16) that served approximately 9.2 million beneficiaries (p. 3). As of June 30, 2005 the Military Health System provided health service support for 1,390,765 Service Members in over 150 countries with 169,200 members deployed in support of Operation Iraqi Freedom and 19,500 in support of Operation Enduring Freedom (Defense Manpower Data Center, 2005). Table 1 depicts projected TRICARE facts and figures for FY2006.

The Military Health System's mission is "To enhance DOD's and our Nation's security by providing health support for the full range of military operations and sustaining the health of all those entrusted to our care" (TRICARE, 2006, p. 1). According to a RAND Research Brief (Hosek & Cecchine, 2001) for the National Defense Research Institute, the Military Health System (MHS) resembles a fairly typical managed care organization but has unique responsibilities arising from two competing missions. One mission is *the readiness mission*, which is "To provide, and to maintain readiness to provide, medical services and support to the Armed Forces during military operations" (Hosek & Cecchine, 2001, p. 2). This mission requires the MHS to maintain medical systems, personnel, structures, equipment, and processes capable of deploying to support any mission, anywhere in the world, as directed by Congress or the President of the United States. The second mission is *the benefits mission*, which is "To provide medical services and support to members of the armed forces, their dependents, and others entitled to DOD medical care" (p. 2). This mission mandates providing 365-day primary, secondary and tertiary care for all 9.2 million eligible beneficiaries throughout the world. Hosek

and Cecchine (2001) see the two missions as being linked in two ways. First, health care provided by the benefits mission contributes to readiness as it maintains the health of the forces required for deployment. Second, the same medical personnel that deliver daily peacetime medical services are also used to support operational missions (Kumpula, 2005).

The readiness mission of the MHS makes the system unique among healthcare organizations. The readiness mission involves deploying personnel and equipment as needed to mobilize, support, and sustain military forces throughout the world in wartime, peacekeeping, humanitarian operations, and during training. The readiness mission implies several tasks that are the responsibility of leaders of medical organizations to successfully deliver healthcare. Support activities such as planning, funding, organizing, training, equipping, and leading ensure the readiness of medical and other military personnel while also contributing to the medical readiness mission.

The effective and efficient implementation of these two missions is ambiguously what leaders refer to as *medical readiness*. However, compounding this reductionist point of view is the dilemma with defining aspects associated with “providing care” and “deployable systems” as well as the operationalizing measures and metrics that comprise these constructs (Coppola, Cuyler & McMahon, 2005). Additionally, the emphasis to balance these two competing missions has historically caused issues in discussing and interpreting priorities and resourcing those priorities within the Military Health System. As a result, Congress requested the Secretary of Defense to evaluate the military’s ability to meet both missions, and document its findings in the National Defense Authorization Act in 1992. Since 1992, numerous extensive studies have been conducted yet only one study has offered a formal definition of medical readiness (Coppola et al.).

Conditions Prompting the Study

As a result of new asymmetric threats, advancing technologies, changing demographics, and developing missions, the U.S. Military must continually address how to provide health service support for its operational forces (Kumpula, 2005). In 1999, the U.S. Senate Armed Services Committee stated, “The military healthcare environment continues to evolve and new variables affect the DHP’s ability to accomplish the mission. Examples of this mission evolution are increased frequency of deployment, force protection issues, and the emphasis on prevention rather than intervention” (Hosek & Cecchine, 2001, p. 63).

The end of the Cold War and the onset of the Global War on Terrorism have changed the way the Department of Defense addresses the issue of medical readiness (OSD, 2004). Since the Gulf War, ensuring medical readiness has been a central concern for DOD. More recently, enemy attacks on the United States national disasters have revealed deficiencies in our ability to respond to all medical demands. As a result, medical readiness has received attention at the local, state, and federal levels. Although researchers, historians, educators, policymakers, and stakeholders in the Department of Defense (DOD) agree that medical readiness is imperative to success, defining medical readiness appears to be an elusive endeavor. Due to the complexity of influences such as various missions, different customers, advancing technologies, different experiences, and personal heuristics; stakeholders have widely varying perspectives of medical readiness. From these paradigms, Services have established different expectations regarding what medical departments should be able to perform. These expectations have resulted in Services establishing their own specific priorities, policies, processes, and procedures.

Contextually, there are several issues surrounding the difficulty in establishing a uniform definition and framework of medical readiness. A major challenge is the requirement of the

Military Health System to deliver world-class health care in a variety of contexts (peacetime, humanitarian, support and sustainment operations, combat operations, etc.), which each require different levels of inputs. Confounding this requirement is the perpetuation of current leaders contending that Service-specific missions demand unique medical readiness requirements. Also compounding the problem is the Military Health System's dual mission, which creates internal competition for resources.

Within the external environment, strategic shifts, technological advancements, and changing demographics affect how the Military Health System delivers healthcare. In January 2006, the Assistant Secretary of Defense for Health Affairs acknowledged this reality stating:

There has never been a more exciting or demanding time to be part of military medicine....We have enjoyed another great year of achievement encompassing advances in science and technology, improved collaboration with the Department of Veterans Affairs (VA), clinical and quality improvements, new measures for protecting the force, implementation of a new TRICARE benefit for reservists, disaster relief, and assistance to Homeland Security, to mention a few. (Winkenwerder, 2007. p. 1)

The Defense Business Board (2006) found the healthcare industry moving toward outcome-based medicine, which is service-driven instead of practice-driven requiring clinical information technology to achieve success. Lastly, technology continues to rapidly advance (in some cases outpacing doctrine), raising the levels of expected readiness. The U.S. Department of Health and Human Services (2004) reported that new and emerging technologies such as drugs, devices, procedures, imagery, and diagnostic tests have "changed patterns of care and sites where care is provided" (p. 1). Ambulatory surgery has grown as a result of improvements in anesthesia, analgesia, noninvasive and minimally invasive techniques. These changes have

experienced growing costs that have led to developing clinical practice guidelines designed to influence providers' treatment protocol and public education campaigns urging consumers to comply with behavioral recommendations and treatment regimens. These changes affect all healthcare organizations, including the Military Health System, which constantly maintains vigilance to deliver the best medical care possible. The U.S. Senate Armed Services Committee states, "All of these variables demand rapid-decision making, effective communication, and reevaluation of priorities and resource allocation (Hosek & Cecchine, 2001, p. 63). The Defense Business Board (2006) also cites unsustainable costs due to duplication and incompatibility of equipment, facilities, training, etc. that results in inefficiencies. Regardless, the Military Health System must continue to support the evolving national military strategy and the emerging strategies and tactics of the 21st century (OSD, 2004, p. 3). Wyse (1997) also offers, "The medical services must maintain a level of readiness to adapt to the unpredictability of any operation" (p. 2).

Importance

The most significant reason to establish a conceptual model of medical readiness is to provide a common framework for all Services to provide health services in support of our Nation's objectives. The Defense Business Board (2006) proclaims, "Citizens of the United States and the Government increasingly view military medicine as a strategic national asset in the time of need, and "health diplomacy is succeeding in winning the hearts and minds in global crises (hurricanes, tsunamis, earthquakes, etc.)" (p. 12, Appendix B). In his FY2006 report to Congress, the Assistant Secretary of Defense for Health Affairs, Dr. Winkenwerder stated, "The mission of the MHS in supporting the security of our nation is reflected in our commitment to individual and unit medical readiness to ensure the health and well-being of our Active

Component and mobilized Reserve and Guard personnel" (TRICARE, 2006, p.1). In his address on medical readiness, Winkenwerder declared:

Readiness to provide combat health support to achieve our national military objectives is the heart and soul of our Military Health System. Health Affairs, the TRICARE Management Activity, and the Service Medical Departments are components of a large and complex organization with many responsibilities to numerous stakeholders-yet at the end of the day, every mission we undertake is intended to support the primary purpose of readiness. (ASD(HA, 2003)

The ability of the U.S. to commit military power is contingent on the readiness of its forces (Joint Chiefs of Staff, 2000). The Joint Chiefs of Staff (JCS) stresses, "The well being and fitness of U.S. Forces for duty is more important and more complicated than ever" (2004, p. 9). Throughout history, the U.S. has "...developed capabilities, maintained readiness postures, and operated abroad as an arm of the Nation to influence international events" (JCS, 2000, p. IV-3). According to Popper et al. (1999), the U.S. Military deploys its forces with minimal lead time which requires forces to be medically ready for any mission, anywhere. Since the end of the Cold War and the onset of the Global War on Terrorism, the United States Armed Forces are more active, mobile, and dispersed than in the past (Joint Staff, 2004). According to the Joint Staff, the U.S. Forces suffered significant reductions in budget and forces after the Cold War resulting in a smaller force. Wyse (1997) reports that engagements in operations other than war such as peacekeeping, peacemaking, and humanitarian missions have resulted in more frequent deployments of medical personnel. To meet operational requirements, the Joint Staff (2004) acknowledges Services have endured an increase in the number and frequency of remote sustained deployments with a growing reliance on the reserve component as a portion of the

deployed force. In 1999, Popper et al. reported, "Historically, up to half of the force identified for deployment at any given time were not medically qualified" (p. 1065).

The second most important reason to develop a conceptual model of medical readiness is to support the Military Health System's transformation to a more unified medical system during a critical period of combat operations, business process improvements, and base realignment and closures (BRAC) that requires a common understanding of medical readiness, with uniform metrics for evaluation. BRAC has already begun forcing MHS elements together physically, "it is now time to consider how to best realign the processes and manpower" (Defense Business Board, 2006, p. 12, Appendix B). Kumpula (2005) stresses transformation will affect how the Service medical departments provide health services and suggests that the MHS must unify efforts to achieve success. Transformation requires the enterprise to maintain readiness for current operations while innovating change for the future (Joint Staff, 2000). Deming (2000) stated, "A system cannot understand itself. The transformation requires a view from the outside." This study is important in providing stakeholders a conceptual model of medical readiness to maintain readiness during transformation efforts.

As the DOD contemplates a unified medical system, it may be an appropriate period to define and publish a definition of military medical readiness. Historically, definitions have attempted to encompass all activities, roles, and goals. However, recent events have revealed deficiencies and oversights. As the strategic plan is developed for a more unified medical system, this paper suggests a conceptual model of medical readiness for the Military Health System to consider. The contributions of this study are important in attempting to provide a common framework for identifying system redundancies and establishing common expectations and practices to recapture efficiencies and economies.

Definitions

For best results, the reader needs a basic familiarity with terms used (Creswell, 2003).

DOD (2006a) defines readiness as “The ability of US military forces to fight and meet the demands of the national military strategy.” In the absence of a more specific definition, Smith and Petersen (1997) offer “Readiness is commonly defined as the ability of forces, units, weapons systems, or equipment to perform as they were designed; it includes the ability to deploy without unacceptable delay” (p. 7). Appendix A provides a glossary of other readiness related definitions for reference. A glossary of acronyms is located in Appendix B.

Models, Maps, and Theories

Models

Robbins (2003) defines a model as an abstraction of reality, a simplified representation of some real-world phenomenon (p. 22). Because the human mind lacks the capacity to meet the requirement for full rationality, individuals operate within the confines of bounded rationality. To reduce the complexities of the world they construct simplified models that extract the essential features from the problem. This bounded mental model provides the framework to operate rationally without considering the full complexities (Augier, 2001).

Conceptual Models

At the simplest level, a conceptual model is a cognitive structure or network of associations between concepts in each individual’s mind (Ward & Reingen, 1990). People receive information, process information, and respond accordingly; the way one interprets information is essentially a conceptual model of how things operate (MacKay, 2006). Shanks, Tansley, and Weber (2003) define a conceptual model as a representation of a real-world domain, constructed from someone’s or some group’s perceptions. “Conceptual models produce

representations of domain concepts and their relations" (Cooke, Salas, Cannon-Bowers & Stout, 2000, p. 17).

Jarvelin and Wilson (2003) contend all research has an underlying model of the phenomena that it investigates. Engelbart (1962) called such models conceptual frameworks or conceptual models. Jarvelin et al. (2003) extended Engelbart's definition asserting, "A conceptual model provides a working strategy, a scheme containing general, major concepts and their interrelations" (p. 4). According to Engelbart, developing conceptual models means specifying: (a) essential objects or components of the system to be studied, (b) the relationships of the object that are recognized, (c) what kinds of changes in the objects or their relationships affect the functioning of the system, and (d) the promise of advancing methods of research. Jarvelin et al. defend "conceptual models are broader and more fundamental than scientific theories in that they set the preconditions of theory formulation" by providing the conceptual tool for formulating hypotheses (p. 3).

Team Mental Models

In recent years, group cognition has received increased attention in the organizational literature (Klimoski & Mohammed, 1994). While historically studies have focused on individual cognition, the shift to group dynamics and team-based organizations have resulted in growing research on group-level cognitive structures, or team mental models. "A team mental model refers to an organized understanding or mental representation of knowledge shared by team members" (Mohammed, Klimoski, & Rentsch, 2000, p. 123). Researchers offer four different content domains of team mental models: (a) knowledge of equipment and tools, (b) knowledge about the work the team must accomplish, such as its goals, (c) knowledge about team member characteristics, and (d) knowledge of team processes.

Cannon-Bowers, Salas, and Converse (1993) suggested that team mental models provide mutual expectations which facilitate information processing, coordination, and prediction of tasks and needs of their teammates. Klimoski and Mohammed (1994) advanced the mental model concept suggesting that team mental models are team member's shared, organized understanding and mental representation of knowledge or beliefs about key elements of the team's relevant environment. Klimoski and Mohammed later found that many researchers in fields of business policy and strategy use terms such as "shared mental models, common cause maps, shared frames, teamwork schemas, transactional memory, and sociocognition...to explain variance in team development, team performance, strategic problem definition, strategic decision making, and even organization performance" (1994, p. 403). Mohammed, Klimoski, and Rentsch (2000) claim the team mental model construct was developed to help explain differences in performance between teams and propose "team effectiveness will improve if team members have an adequate shared understanding of the task, team, equipment, and situation" (p. 124). Cooke et al. (2000) assume that the team mental model evolves over time with experience. "According to existing models, team mental models bring explanatory power to theories of team performance by influencing team capacity (readiness) and directly impacting team processes" (Mohammed et al., p. 125).

Technological developments have drastically changed the nature of many tasks (Howell & Cooke, 1989). Tasks previously requiring repetitive manual skills now require cognitive skills to supervise and incorporate information into monitoring, planning, designing, and decision making. Furthermore, the complexity of tasks has surpassed the abilities of individuals that now require a team approach. Salas, Cannon-Bowers, Church-Payne, and Smith-Jentsch (1998) suggest teams play an increasingly critical role in complex military operations in which

technological and information demands necessitate a multi-operator environment. Salas, Dickinson, Converse, and Tannebaum (1992) define a team as “a distinguishable set of two or more people who interact dynamically, interdependently, and adaptively toward a common and valued goal/object/mission, who have been assigned specific roles or functions to perform, and who have a limited life span of membership” (p.126). Cannon-Bowers, Salas, and Converse (1993) make an important distinction between teams and groups, establishing that teams have differentiated roles and responsibilities that enable them to accomplish tasks too complex for any individual. With the Military Health System’s shift to interoperability and increasing joint operations and partnerships, a shared mental model may facilitate achieving successful readiness outcomes.

Concept Maps

Although several methods such as cluster analysis and tree diagrams have been successfully used to assess and represent domain concepts and their relations, the research design of this study supports concept mapping. Text-based cognitive mapping was selected as an appropriate concept mapping tool to *elicit and represent* medical readiness. According to Mohammed et al. (2000) elicitation is determining the components or content of a mental model and representation is revealing the structure of data or determining the relationship between elements in the team’s knowledge structure. Structure provides information on how a set of elements within a knowledge domain are organized from the perspective of the whole set. Many techniques such as maps and models provide a graphical representation of the cognitive structure, which can be more informative than a narrative. Text-based mapping was selected for its advantages of being an economical, non-invasive, nonreactive data collection technique, capable of collecting large amounts of data, from large samples, over long periods of time

(Mohammed et al.). The selection of this technique was balanced against the danger of imputing one's own assumption into the knowledge structure (Walsh, 1995) and imposing structure that does not exist. Text-based maps are rich in descriptive detail and portray decision makers' thinking about their environment in operational terms (Fahey & Narayanan, 1989).

Mohammed et al. declare that cognitive mapping methodologies are graphic representations of the content and structure of a particular domain "used extensively by researchers in organizational behavior, strategic management, and political science" (p. 132). According to Stubbart and Ramaprasad (1990), it was one of the first cognitive measurement techniques introduced in management research and has been applied to study organizational cognition and strategy. Huff and Fletcher (1990) further conclude that cognitive mapping is the preferred tool for accessing large sources of data generated by organizations and may examine relational phenomenon. Huff and Fletcher offer two ways in which to generate content to be mapped. The first is through interactive questionnaires and interviews and the second is through post hoc analyses of documents and transcripts. Formally, the two types of mapping are referred to as interactively elicited cause mapping and text-based cause mapping (Mohammed et al.).

Bougon (1983) argues that many types of maps exist because concepts can be linked by various types of relationships (e.g. contiguity, proximity, resemblance, continuity, implication, causality). Mohammed et al. maintain "a map frequently used in organizational literature is a cause (means-end) map" (p. 132), which according to Eden, Jones, Sims, and Smithin (1981) represents the causal links between concepts in the following way: "concept A has consequences for or can be explained by concept B." According to Gray, Bougon, and Donnellon (1985), "causality is conceptually and instrumentally the most potent of all relations" (p. 85).

With an assumption that text contains a representation of the author's mental model at the time the text written (Carley, 1997), text-based cognitive maps are developed through systematically coding documents that represent the writings or statements of individuals or the group (Weick & Bougon, 1986). Text-based cognitive mapping differs from traditional content analysis in that content analysis typically focuses on counting the frequency a concept appears in a document, while text-based cognitive mapping extracts the concepts and relationships between concepts with the researcher interpreting the material, eliciting important concepts, and generating the map (Carley, 1997; Huff & Fletcher, 1990).

Mohammed et al. (2000) demonstrate that text-based cognitive maps have been generated from a variety of sources including open-ended questions, narratives, governmental publications, court cases, transcripts, and annual reports. Some researchers suggest transcripts are more valid sources of cognitive maps because public documents tend to be subject to intense scrutiny and self-presentation. Barr, Stimpert, and Huff (1992) criticize annual reports because they are prepared by public relations departments and are extensively edited to suppress negative information. Because there is such a large quantity of public documents, Fahey and Narayanan (1989) recommend researchers adopt decision rules to sample statements for mapping.

Fahey and Narayanan (1989) delineate a five step process for creating cognitive maps from archival data. Sequentially, researchers select data sources, derive the concepts and linkages of the raw cognitive maps, recast causal assertions into theoretical categories, aggregate cognitive maps over time, and specify the strengths of relationships. Huff and Fletcher (1990) emphasize the scale, detail, and features of maps are dependent on the purpose which the map was drawn and "in the final analysis represent a compromise between theoretical goals and practical concerns."

Theories

Creswell (2003) contends that theories serve different purposes in inquiry. In quantitative research, a theory is “a set of interrelated constructs (variables), definitions, and propositions that presents a systematic view of phenomena by specifying relations among variables, with the purpose of explaining natural phenomena” (Kerlinger, 1979, p. 64). However, in qualitative research, the inductive nature may result in developing categories that reveal patterns, theories, or broad generalizations (Creswell, 2003). Lincoln and Guba (1985) refer to a pattern theory as an explanation that develops during qualitative research. Neuman (1991) expounds on pattern theories, explaining:

Pattern theory does not emphasize logical deductive reasoning. Like causal theory, it contains an interconnected set of concepts and relationships, but does not require causal statements. Instead, pattern theory uses metaphor or analogies...Pattern theories are systems of ideas that inform. The concepts and relations within them form a mutually reinforcing, closed system. They specify a sequence of phases or link parts to a whole. (p. 38)

The building blocks of theory are used to develop a conceptual model. The conceptual model forms the basis for generating propositions which may be followed by research methodology, case study, and research design (Yin, 1994). Summary models provide overviews of research domains and lists factors affecting the phenomena (Jarvelin & Wilson, 2003). These models propose the factors that influence the domain of interest but do not provide the detail of components that may suggest hypotheses to be tested.

To adequately understand a theoretical model of medical readiness, it is first necessary to define the various parts of a theory. In an attempt to standardize the language and components

for theory development, Bacharach (1989) provides criteria for defining, constructing, evaluating, and comparing theory. The criteria offered are significant because they reform earlier criteria for theory development and evaluation. Bacharach further asserts that many existing theories lack essential components and therefore, fail to qualify as a theory when the proposed criteria are applied. To ensure only qualified expressions are labeled as theory, researchers must understand what constitutes a theory, how it is constructed with specific components, and why it is evaluated.

Bacharach (1989) defines a theory as "... a statement of relations among concepts within a set of boundary assumptions and constraints" (p. 496). This definition establishes essential architectural components that a theory must contain to adequately represent a phenomenon. A theory or theoretical model can also be defined as a system of constructs and variables. Constructs are defined as terms which are not observable either directly or indirectly, but may be applied or even defined on the basis of observable properties, often referred to as variables. A variable is an observable being, object or event that is capable of assuming two or more values. These values denote the requirement for empirical data that can be quantified. In addition, constructs may consist of additional endogenous constructs that assist in explaining phenomena. Bacharach illustrates concepts as constructs and statements as propositions. However, because a construct is a latent variable, and cannot be operationally defined or measured, each construct must be represented by a variable that is capable of being operationally specific and defined by its measurement. Logically, the proposition that relates two constructs cannot be scientifically determined and must be demonstrated through expressing a representative hypothesis and measuring the relationship between the construct-derived variables. Through empirically measuring the hypothesis, a researcher can then conclude that a similar relationship exists within

the proposition, similar to the relationship of a statistical sample to its population. Figure 1 depicts the structural components of a theory and the relationships between components. Rationally, a theory lacking one of these components fails to qualify as a theory by description alone. Bacharach further suggests that every theory is constrained by the space and time in which it was developed which may limit its generalizability.

Criteria for evaluating theory present important challenges for researchers to address when framing their question. A theory must be subject to testing for falsifiability and demonstrate utility (Bacharach, 1989). For adequate evaluation, researchers must carefully design their theory to contain conceptual components at the propositional and hypothetical levels, and recognize the distinction between the relationships at each level. Specifically, researchers must select valid, non-continuous, and reliable variables that adequately represent the constructs in question. Within a theory, the propositional level lacks empiricism but offers a wider construct that potentially has greater application and generalizability. Conversely, the hypothetical level offers the researcher observable variables, with measurable relationships, for testing, explaining and predicting relationships but is often too specific for greater utility within a system. Therefore, the dichotomous levels must exist in the framework of research for consideration as a theory.

Bacharach (1989) emphasizes a theory must have epistemological benefit. Coppola, Hudak and Gidwani (2002) posit organizational theories evolve as an attempt to identify and explain how critical factors such as leadership, communication, control, and structure influence an organization. Bacharach's criteria for defining, constructing, and evaluating a theory promote the standardization of theory development and establish common language, components, and mechanics by which theories may be compared. By universally utilizing Bacharach's blueprint

for constructing and evaluating a theory, researchers may discover commonalities and relationships between constructs of previous theories, which consequently improve the connectivity of the empirical world. Likewise, the application of the proposed criteria to existing theories may disqualify some and cause others to be reevaluated using new criteria.

Theoretical and conceptual models attempt to describe natural phenomena and can assist in establishing general guidelines and predictions about the object under study. According to Bacharach (1989), a conceptual model is considered useful if it can explain constructs, variables, and linkages that predict phenomena. The relationship between constructs, variables and measures should be organized and expressed succinctly and effectively. Finally, the theoretical model must be constructed in a manner that it can be empirically refuted. For example, quality, as related to health care, is a theory and a derivative construct of quality is outcomes. Outcomes can be operationalized as mortality which becomes a variable of the outcomes construct, and can be discussed as patient mortality (i.e. living or deceased) which is a measurable “outcome” and generally accepted indicator of quality. Within each variable, measurements provided observable indicators. In this example quality is being indirectly observed by measuring mortality as a variable. According to Bacharach’ criteria, military medical readiness is a latent variable and must be expressed as a construct because it lacks empiricism (Coppola, Cuyler & McMahon, 2005). Therefore, the construct of medical readiness must be measured using variables as theoretical tools to represent medical readiness.

Methodology

Research Design

Research design is the logic that links the methodology of data collection and analysis to the initial research question (Yin, 1994). The design specifies the appropriate collection techniques and analysis tools to achieve solid findings.

Qualitative Inquiry

Qualitative inquiry is an inquiry process that uses a naturalistic approach to understand phenomena in context-specific settings (Patton, 1990). The qualitative research paradigm differs from quantitative analysis which uses logical positivism, experimental methods, and quantitative measures to test hypothetical generalizations and seek causal determination. Instead, qualitative inquiry seeks to understand the complex and dynamic phenomena of the world through inductive and deductive analysis (Hoepfl, 1997). Ploeg (1999) offers qualitative data analysis is not concerned with statistical analysis like quantitative analysis but with the analysis of codes, themes, and patterns in the data. Strauss and Corbin (1990) broadly define qualitative research as “any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification” (p. 17). In qualitative research, “The researcher builds a complex, holistic picture, analyzes words, reports detailed views of informants, and conducts the study in a natural setting” (Creswell, 1998, p. 255).

Strauss and Corbin (1990) suggest using qualitative analysis to explore any phenomenon that is not well understood, to gain new perspectives about things that much is known about, or to gain more information that may be difficult to convey quantitatively. Hoepfl (1997) makes the compelling assertion that qualitative methods are appropriate in situations where variables are

unknown and must be discovered for subsequent quantitative evaluation or when the researcher has determined that quantitative measures cannot adequately describe or interpret the situation.

Creswell (2003) recommends three framework elements for designing and conducting research. First, a researcher must have certain philosophical assumptions to inform the research about what constitutes knowledge claims. Creswell defines a qualitative approach as “one which the inquirer often makes knowledge claims based primarily on constructivist perspectives... where the researcher collects open-ended, emerging data with the primary intent of developing themes from the data” (p. 18). Second, a strategy of inquiry is required to provide direction for inquiry procedures. Methods are the third element, which offer detailed procedures of data collection, analysis, and reporting. Creswell describes qualitative data analysis as “...an ongoing process involving continual reflection about the data, asking analytic questions, and writing memos throughout the study” (p. 190). As a phenomenon that is not understood, the exploratory nature of this study’s research question supported using a **constructivist theoretical perspective**, grounded theory strategy, and qualitative research method.

Theoretical Perspective

To understand the meaning of medical readiness, the domain was examined using a constructivist paradigm. This perspective assumes that individuals develop subjective meanings of their experiences which lead to multiple different meanings among each other. Using social constructivism, the aim is to inductively discover the domain’s complexities, interpret the meaning, and develop a pattern of meaning regarding medical readiness (Creswell, 2003). Crotty (1998) offers three assumptions of constructivism: (a) meanings are constructed by human beings as they engage the world they are interpreting, (b) humans engage their world and make

sense of it based on their historical and social perspective, and (c) the generation of meaning is always social, arising in and out of interaction with the community.

Strategy

To identify components and patterns, a grounded theory strategy was followed.

Grounded theory refers to a theory that is developed inductively from a body of data (Borgatti, 2007). Creswell (2003) defines grounded theory as “[when]...the researcher attempts to derive a general, abstract, theory of a process, action, or interaction grounded in the views of the participants in the study” (p. 14). Using grounded theory, the researcher examines many different cases, assumed to only represent part of the whole, in order to discover the whole (Borgatti).

Borgatti contests that only then can the researcher discover the many variables that interact in complex ways to produce certain outcomes. The basic strategy of grounded theory is to read and re-read textual data to discover variables (sometimes referred to as characteristics, components, categories, concepts, or properties) and their relationships. Borgatti refers to the ability to perceive variables and relationships as “theoretical sensitivity” (2007, p. 2). For the purposes of this study, government documents were reviewed to acquire informed perspectives of military healthcare leaders and other stakeholders. Selected documents examined were “grounded” in the perspective and written words of the authors. However, a variety of other sources such as articles, interview transcripts, and focus group summaries were included to capture a variety of perspectives and triangulate findings (Patton, 2003). When and where possible, quotes were captured to document perspectives. To develop the theory, the researcher collected and compared data and remained cognizant of any emerging themes and categories. Categories were examined for interrelationships and sampled using different groups, sources, and cases to evaluate similarities and differences.

Method

To examine medical readiness holistically, an inductive approach was selected. Inductive analysis refers to discovering categories and themes that emerge from the data rather than having categories imposed on them prior to collection and analysis (Patton, 1990). Using this approach, key phrases or terms are elucidated then categorized or grouped to a larger domain if applicable. This approach is most appropriate for programs and constructs surrounded by confusion where variations exist among participants (Patton, p. 390). Therefore, the researcher must examine multiple, socially and historically constructed meanings to extract the underlying characteristics and themes and attempt to develop an all-inclusive coherent meaning of the construct. Using inductive analysis, data were reviewed for key phrases and terms that are used by participants to describe medical readiness. Patton argues that the second task of induction is for the analyst to identify patterns, categories, and themes from which a typology can be constructed to examine relationships at various levels. Patton cautions that analysts must avoid creating categories that do not really exist and suggests presenting categories to program participants to determine if the constructions make sense. Weber defines a category as “a group of words with similar meaning or connotations” (1990, p. 37).

Initially, collected documents were thoroughly read to establish a general sense of the information and determine eligibility for further analysis. Within each document, any text regarding key attributes, characteristics, descriptions, purpose, mission, goals, objectives, functions, outcomes, expectations, successes, failures, and stakeholders were manually highlighted. When appropriate, marginal notes were made on documents to start recording general thoughts for later recall. On several occasions, selected text was intuitively coded by

writing the code next to the appropriate text for later consideration. The analysis of documents included multiple observations, from multiple sources, that spanned 27 years.

Analysis

Thematic analysis focuses on inductively and deductively discovering patterns, themes, and categories within the collected data and evaluating it against existing conceptual frameworks (Patton, 2003). Busch et al. (2005) argue the first step of content analysis is called conceptual analysis which establishes the existence and frequency of a concept represented by words or phrases in a text. The second type is relational analysis which examines relationships among the concepts. In qualitative research, the analytical process begins during data collection as the researcher identifies relevant concepts to capture which begins to shape data collection (Pope, Ziebland & Mays, 2000). Pope et al. contend that continuous analysis is almost inevitable in qualitative research because the researcher is constantly engaged in determining what data to collect and incessantly contemplates about how the data is relevant to the research question and related to other collected data. Where most qualitative studies engage in content analysis by counting the instances of a phenomenon, this evaluation strives to identify the components and recurring themes of the medical readiness phenomenon found in textual analysis. Semler (2001) advises that content analysis is much more than simple word counts. He further warns that when content analysis uses word-frequency count, an assumption is made that more frequent words reflect greater emphasis which may be an error of commission on the part of the researcher. Weber (1990) echoes this concern offering that synonyms are often used for stylistic reasons throughout a document and may lead a researcher to underestimate the importance of a concept. Holsti (1969) offers a broad definition of content analysis as, "any technique from making inferences by objectively and systematically identifying specified characteristic of

messages" (p. 14). This form of content analysis enables the researcher to sift through large volumes of data to discover patterns from conceptual relationships, chronologies, taxonomies, language analysis, and repetitions existing within the data (U.S. GAO, 1996). Semler supports that content analysis is useful for examining trends and patterns in documents and provides an empirical basis for monitoring shifts in public opinion, while allowing inferences to be made which can then be corroborated by other methods. "What makes this technique particularly rich and meaningful is its reliance on coding and categorizing data" (Semler, 2001, p. 3). Relevant data are examined using a process called constant comparison in which each category is checked against the other data to establish categories and relationships (Pope et al.). Initially, categories are created to reflect as many of the nuances in the data as necessary. Although many categories may exist, the analysis and theoretical ideas that develop during the research begin to inform the researcher that certain characteristics may belong to a more abstract category and related to other categories. This continuous analysis results in further refining and reducing the number of categories by grouping related variables.

Coding

The process of identifying, naming, labeling, and categorizing phenomena and variables emerging from the data is known as open coding (Borgatti, 2007). Open coding refers to identifying text that is relevant to the research question and asking, "What is this text representing?" Creswell (2003) suggests that coding is a five step process where: (a) the researcher initially reads through the data, (b) identifies relevant text, (c) labels the selected text with codes, (d) reduces overlap and redundancy of codes, and (e) collapses the codes into themes. Once relevant text is identified, the concept that the text is representing is assigned to that text as a label. The labels used refer to nouns and verbs representative of the conceptual

world and may be specific or abstract (Borgatti). The researcher normally assigns specific labels such as clinic, hospital, doctor, nurse, etc. to the text and then begins to discover more general categories such as medical facilities, healthcare providers, etc. that encompass the earlier specific labels. Borgatti argues that in grounded theory, coding is normally performed informally, where after coding some initial text, if subsequently a new category is discovered the researcher does not normally go back and recode earlier text but maintains an inventory of codes that represent concepts. Therefore, as codes are developed the researcher should write memos and code notes for later development, synthesis, and report. Borgatti further emphasizes the importance of identifying fairly abstract categories, representative of the more concrete categories, because the abstract categories help to generate general theory. To facilitate identifying interrelationships among categories, axial coding was used. "Axial coding is the process of relating codes (categories and properties) to each other via a combination of inductive and deductive thinking" (Borgatti, 2007). In grounded theory, the researcher attempts to fit things into a basic frame of generic relationships among the categories. The relationships discovered during the analysis serve to support the theoretical framework.

Data Collection

Patton (2003) offers that qualitative evaluations use three kinds of data collection: (a) interviews, (b) direct observation, and (c) written documents. Data collected for this study consists of text excerpts captured from written organizational and program records, memoranda and correspondence, official publications and reports. Multiple data from many internal and external sources were collected for analysis. To best understand the research problem, primary documents examined were reports, audits, policies, briefings, and testimonies regarding the development and implementation of medical readiness. Primary documents were authored by

government agencies such as the U.S. Government Accounting Office (U.S. GAO), Department of Defense Inspector General (DODIG), Office of Management and Budget (OMB), Assistant Secretary of Defense for Health Affairs (ASD(HA)), Joint Chiefs of Staff, and Offices of The Surgeons Generals (OTSG), etc. Often these documents contained results of considerable observations and structured interviews that represented the language and words of participants, observers, and evaluators. These documents enabled the author to obtain a perspective “grounded” in the participants’ lexicon. Other primary documents selected were annual reports and doctrinal documents prescribed by or relevant to the Department of Defense and Military Health System. These documents included regulations, policy memoranda, and operating publications. These public documents provided convenient, timely, and inexpensive access to unobtrusive sources of information. Other documents collected included articles (from refereed and non-refereed journals), news articles, press releases, testimonies, speeches, symposium presentations, and after action review (AAR) comments. These documents provided an essential complementary source of information that again provided grounded perspectives and first hand accounts about components of medical readiness.

Boundaries

Boundaries were established to omit classified information and maintain focus on the units of analyses. The author attempted to refrain from conducting in-depth investigation into each particular Service and maintain focus on the encompassing aspects of the Military Health System. Although reviewed, elements from documents classified as “For Official Use Only” (FOUO) or higher were omitted from inclusion into this study. It is the author’s judgment that the omission of these documents does not affect the findings of this study.

Researcher's Role and Approach

The author approached this study as an observer of documents and was not a participant in the development of any documents reviewed. Although a dominant outsider perspective was taken, the author's own experiences in the military and healthcare likely influenced the document analysis. The focus of observations concentrated on maintaining a holistic view of military medicine that required constant vigilance in detecting evolving and emergent content. Prior experience in both operational and institutional medical and non-medical organizations provided an experiential basis for identifying and selecting key properties related to medical readiness and likely influenced categorization of characteristics.

Literature Review

To develop a model of military medical readiness, it is necessary to review documents and literature to gain a holistic understanding of the construct. The purpose of this review is to highlight key components and relationships related to medical readiness and to convey the confusion and evolving nature surrounding medical readiness. An inductive approach was adopted for each document to extrapolate and report key concepts. As a validity test of the author's assumption, the author suggests posing a simple question to peers, superiors and subordinates, "What is Military Medical Readiness?" Similar to the various definitions and perspectives presented in the review, readers will likely receive as many unique responses to this question as people that are asked. A review of recent literature discussing medical readiness offers insight as why medical readiness is such a difficult topic to consider. Following this literature review, a theoretical model and conceptual model are proposed that may help provide a common framework for discussions surrounding medical readiness.

The Military Health System's Mission, Vision, and Goals

To establish a current frame of reference the current Military Health System mission, vision and goals are provided as a foundation. The mission of the MHS is “To enhance the Department of Defense and our Nation’s security by providing health support for the full range of military operations and sustaining the health of all those entrusted to our care” (ASD(HA), 2007, p. 7). The MHS vision is “A world class health system that supports the military mission by fostering, protecting, sustaining, and restoring health” (TRICARE, 2006, p. 1). Key priorities and goals are: (a) improve force health protection and medical readiness; (b) improve performance of TRICARE health program; (c) improve coordination, communication, and collaboration with other key entities; and (d) address issues related to attraction, retention, and appropriate training of military medical personnel’ (p.1). The Department of Defense (DOD) Dictionary of Military and Associated Terms defines military readiness as “the ability of U.S. military forces to fight and meet the demands of the national military strategy” (2006a). It further identifies readiness as the synthesis of the two interrelated echelons – unit readiness and joint readiness.

Sources

The following literature review expands earlier work conducted by Coppola, Cuyler, and McMahon (2005) and an unpublished manuscript. While some of the reviews have been modified and supplemented to support this project, it is used with the expressed permission of the authors. Table 2 presents selected definitions of medical readiness uncovered by Coppola et al. Reviews are presented chronologically to establish the complexity of the Military Health System and its progressive attempts to define medical readiness and its components. Coppola et al. (2005) revealed several additional authors and papers that discussed medical readiness over a broad military spectrum that differ from the published DOD definition. This review suggests a

wide variance in interpretation and application. Furthermore, these alternative definitions have attempted to guide standards and measures relating to military medical readiness that have affected current interpretation, procedures, and application. This outcome is reasonable when considering that understanding the process of developing medical readiness policy differs from Service to Service, and leader to leader. Although not the intent or purpose of this study, deficiencies related to medical readiness are presented only to demonstrate the variation and magnitude of confusion, noncompliance, or selective compliance.

A thorough review of the literature using the Defense Technical Information Center (DTIC), the National Technical Information Service (NTIS), and Federal Research in Press (FEDRIP), archives of the Naval Post-Graduate School, and policy memoranda obtained from the Assistant Secretary of Defense for Health Affairs (ASD(HA)) produced a comprehensive study of medical readiness. In lieu of a common definition, there are some refereed journals, DOD technical documents, federal sector web based offerings, and Service-specific policy memos that fill various gaps in helping leaders understand medical readiness.

In general, military medical readiness within the Military Health System has received considerable scrutiny from several sources that include, the United States Congress, Congressional Budget Office, U.S. General Accounting Office, DOD Inspector General, Joint Chiefs of Staff, and DOD affiliated research groups. The following review spans literature selected from 1983 to April 2007.

Chronological Review of Military Medical Readiness

1983. The Joint Staff issued guidance identifying readiness as a relationship between supplied equipment and the equipment's effective operational use by individuals. The philosophy mirrored the management by objectives philosophy popular during this time in the military. In

this respect, readiness was defined as a good fit between personnel and tools. However, lacking in this explanation was a requirement for training and measurement, along with other control variables. In response that same year, Yarrington (1983) suggested that medical readiness was an illusionary term, dependent upon elucidation, time and environment. Yarrington reviewed historical changes in readiness policy formulation and the evolution of battlefield casualty management that forced changes. His recommendations for future improvements can be viewed as progenitors to many of the current methodologies used to measure medical readiness. An additional seminal, article on readiness was published by Gordon and Bisgard in 1983. The authors discussed medical readiness from a planning and policy perspective, offering several constraints analogous to a linear program that might assist in forecasting issues associated with medical evacuation planning. The methodology centered on available resources necessary to predict time-based requirements during a wartime scenario for the movement of personnel.

1988. This differed in contrast to a study by Nolan (1988). Nolan reviewed medical readiness from a strict organizational and tactical point of view in an effort to identify readiness shortfalls. He proposed adopting a framework that allowed for standardization of deployable medical assets by creating a distinctive link between operational and deployable medical units with brick and mortar facilities. Nolan suggested a unique conceptual model that wedded both vertical and horizontal systems within one framework. A tenet of this model was the ability and requirement to account for reliability associated with mission outcomes. Reliability was defined as having consistent outcomes within the process.

In 1988, the Department of Defense published the first *Medical Readiness Strategic Plan* (MRSP) in response to the National Defense Authorizations Act of 1987 to "develop an integrated master plan for curing the ills of the wartime medical readiness system by the end of

1992" (ASD(HA), 1998, p. 22). Although the vision of the plan was evaluated as appropriate for the prevailing international security environment of that time, the end of the Cold War radically changed the global security environment which demanded a shift in U.S. National Military Strategy and military health support. The MRSP contained 75 action plans distinctive to the Army, Navy, and Air Force which each Service can conceptualize individualized actions it deems relevant to answering the readiness requirements. As conditions, requirements, and environmental demands have changed, the ASD(HA) has revised the MRSP several times over the years.

1990. According to the U.S. GAO (1996a), Operation Desert Storm revealed many weaknesses in DOD medical capabilities with DOD Inspector General studies revealing other shortcomings in providing adequate, timely, medical support during contingencies (p. 1). After reviewing initial lessons learned from Operation Desert; Davis, Bachman, Normile, and Skinner (1990) suggested that forecasting requirements for military medical readiness should be based on a retrospective review of best practices and that training plans should be designed to meet future and potential threats. In this document, unit training was presented as a key element for evaluating medical readiness effectiveness.

1993. The National Defense Authorization Acts of 1992 and 1993 directed a study to assess the economics of sizing the military medical establishment, known as the 733 Study. DOD began significant efforts to determine wartime medical personnel requirements for 2001 in the 733 Study. Under the premise that medical manpower could decrease commensurate with the reduction in force, results of the study indicated the Services could conceivably cut the current structure by 50 percent. However, the findings were controversial and challenged due to its failure to consider the MHS institutional support in sustaining the force and focusing only on

wartime requirements (Bedsole, 1996). The U.S. GAO (1996b) also noted that the study's results differed from earlier studies for two major regional conflicts. This controversy shed light on the complexity of maintaining medical readiness to support military operations and the benefits mission.

The DOD Inspector General (1993) issued a report criticizing DOD for its lack of joint medical planning stating that DOD could not ensure the deployability of medical personnel during contingencies. The DOD IG cited outdated methods for determining personnel requirements, malutilization and assignment of personnel to incorrect skill areas, and inadequate training. The report also noted the lack of sufficient mobility and incompatible communications capabilities that limited the ability to prepare for incoming casualties.

1994. Coppola, Cuyler, and McMahon (2005) discovered the ASD(HA) issued guidance in 1994 describing medical readiness as a composite variable encompassing several simultaneous and interrelated missions such as mobilization, deploying, sustaining and providing war and peacetime healthcare in a variety of environments. Some consider this the first period where military and civilian leadership realized the complexities, costs, and choices associated with the delivery of both peacetime and wartime care. It was also around this time that Medicare Eligible Military Beneficiaries (MEMB) lost access to military healthcare facilities and were forced to seek care from VA and Medicare authorized civilian providers (Coppola et al.).

Strategically, the *Defense Planning Guidance* was modified in 1994 requiring DOD to prepare for smaller scale operations other than war (OOTW) and be ready to simultaneously engage in two regional major conflicts (U.S. GAO, 1996a). In tandem, the Joint Staff recognized the Services' inability to provide adequate lift capabilities for moving medical logistics and deployable hospitals in support of two major regional conflicts. This highlighted the need for

operational medical systems to reduce their transportation demands. As a result, "The Joint Staff recommended that the Services investigate the possibility of evacuating casualties more quickly to the United States for treatment" (U.S. GAO, 1996, p. 3). This initiative would prove to change the size and mobility of operational medical units and how the Military Health System approached theater hospitalization and evacuation in the future.

1995. The ASD(HA) released the *Department of Defense Medical Readiness Strategic Plan: 1995-2001 (MSRP 2001)* as a long range plan; developed by functional panels to provide DOD with an integrated, coordinated, and synchronized plan for attaining and sustaining medical readiness through the year 2001 and beyond. Considered the first comprehensive update of U.S. medical readiness strategy since 1988, the MRSP 2001 was designed to serve as the compass for articulating requirements and resources, and developing policies and procedures. The MRSP 2001 provided a medical readiness vision for 1995-2001. The vision presented nine separate functional areas: planning; requirements, capabilities and assessment; command, control, communications, and computers (C4) and information management; logistics; medical evacuation; personnel; training; blood; and readiness oversight. As a result, 42 action plans were developed to address the functional shortfalls (U.S. GAO, 1996). Approved in 1993, this appears to be DOD's first published definition of medical readiness:

Medical readiness encompasses the ability to mobilize, deploy, and sustain field medical services and support for any operation requiring military services; to maintain and project the continuum of healthcare resources required to provide for the health of the force; and to operate in conjunction with beneficiary care (ASD(HA), 1995).

The *MRSP 2001* specified 42 actions plans requiring medical capabilities necessary to provide: (a) medical support for the continuum of military operations; (b) military health care

providers fit to deploy, trained in military medicine and trained on equipment of their respective deployable unit; (c) leaders sound in military medical doctrine, tactics, techniques, and procedures; (d) medical units capable of rapid deployment to sustain medical support for any mission; (e) flexible and mobile units capable of being tailored for a variety of mission; (f) a medical evacuation system that incorporates multiple evacuation platforms into a seamless intra-theater and inter-theater evacuation system which incorporates interoperable patient movement items; (g) medical information systems that accommodate command and control, logistics, and patient movement; and (h) medical units and vehicles capable of communicating by voice and other means with supporting and supported forces across all Services (ASD(HA), 1995, p. 6). A significant achievement was the establishment of the Combat Casualty Care Course designed to provide wartime medical readiness training in a joint setting (Coleman, 2001).

DOD Instruction 1322.24, *DOD Military Medical Readiness Skills*, was published directing all personnel should be trained in basic first aid and Services must define skills and training requirements (Coleman, 2001). Healthcare personnel and units were instructed to receive initial and sustainment readiness training and complete all service and command deployment training requirements within one year of entering the military. This document instructed medical personnel to receive no less than five days of annual medical readiness training and required training with their assigned operational unit at least every three years.

Prepared at the request of the House Committee on National Security, the Congressional Budget Office (CBO) examined the way in which the military medical system trains for wartime and the extent to which providing peacetime care contributes to that mission. The CBO (1995) found:

The military health care system is one of the largest health care systems in the nation, and one of the most complex systems to manage because of its structure. It consists of two parts: the direct care system of military medical centers, hospitals and clinics; and the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS), an insurance program that supplements the care that beneficiaries receive (p. 5).

The CBO (1995) also discovered spending on medical care had increased by about 65% from 1979 to 1995, increasing from four percent of DOD's 1979 budget to six percent of the 1995 budget. CBO identified inefficiencies in the department delivery of health care and its allocation of resources with no adequate incentives to control the use of care and the separate management of resources by each Service. The CBO uncovered a weak relation between peacetime care and wartime training requirements, complaints of poor access, and high CHAMPUS costs. The CBO reported, "Satisfying beneficiaries while holding down health care costs presents DOD with an impossible set of challenges" (p. 6). In presenting alternatives to improve training, CBO suggested providers practice in the civilian sector and affiliating with civilian shock trauma units.

In response to the results of the 733 study, 1995 also witnessed each Service create its own model to determine medical personnel requirements. The Navy developed the Total Health Care Support Readiness Requirement model and the Air Force utilized a similar model justifying 99 percent and 86 percent, respectively, of their FY1999 personnel projections. Whereas the Navy and Air Force used 733 estimates as their baseline wartime requirements, the Army developed the Total Army Medical Department Personnel Structure Model using its own Total Army Analysis process to estimate requirements. The Army's process justified 104 percent of its FY1999 personnel projections. The Services calculations offset nearly all of the reductions

estimated by the 733 study (U.S. GAO, 1996b). Support for a common framework again appeared when the U.S. GAO cited that although the techniques of the different models appeared reasonable, the “results depend largely on the values of the input data and assumptions used” (p. 2). Determining medical personnel requirements continues to be one of the leading and contentious issues eluding the MHS.

1996. In January, Horne (1996) developed a medical readiness framework for relating TRICARE and readiness. In his work at the Center for Naval Analyses he defined many of the different stakeholders’ perspectives and suggested performance indicators that might be appropriate toward reaching the objectives of each perspective. Horne claims the health practitioner’s objective was to “have Service Members free from medical problems” (p. 2) suggesting indicators may include the rate of medical problems as measured by inpatient and outpatient visit data and wellness measures. From the field commander’s perspective, the health readiness objective is to “have deployable personnel” indicated by compliance with deployment medical requirements (immunizations, physical screenings, etc.) as well as the number of Service Members returned from theater for medical reasons. Horne suggests the leader’s objective is to keep the Service member healthy and available for performing duties. Indicators that support this objective may be the number of personnel on limited duty or absent for medical reasons. Horne addresses the importance of historical data through the historian’s objective to learn from our past. Examples of indicators include prevalence rates of disease and non-battle injuries to forecast preventive medicine capabilities. According to Horne, the mission planner’s health readiness objective is to be prepared to “provide the kind of care needed depending on the particular mission” (p. 2). Horne suggests that case mix, patient mix, and training data may indicate what health personnel are currently capable of performing and then relating it to mission

scenarios to determine what additional requirements are still necessary. Horne uses the example of evacuation as a functional area that strategic planners are concerned with and submits that training and historical data on evacuation time from injury to definitive care is an indicator of performance. Other perspectives include the trainer's, Services, and operator's. Horne admits:

It is difficult to measure medical readiness directly. Other than performance data from exercises, few direct measures of readiness exist. Consequently, military analysts measure readiness in terms of manning levels, the completion of training, and the operational condition of equipment. Although these factors will affect the mission performance of the forces, they are at best only indirect measures of readiness (Horne, 1996, p. 7)

During Horne's research, he discovered that when asked about medical readiness, answers had two orientations (1996). Horne coined the first orientation "health readiness" which was concerned with the health of individuals and the second "care readiness" which was concerned with those providing the care. According to Horne, health readiness involves maintaining the health of military personnel in preparation of future military operations. Correspondingly, care readiness involves the readiness of medical personnel and equipment to provide care in support of executing military operations. As related to TRICARE, Horne determined that TRICARE is instrumental in supporting health readiness through its provision of care to Service Members. Likewise, TRICARE supports care readiness by providing the military medical establishment with resources and experience that is useful in preparing providers to deliver care during military operations. The important contribution of Horne's work is the recognition of the various perspectives regarding medical readiness and offering a perspective-based framework with measurable indicators of performance.

“In February 1996, Health Affairs began its Military Health Services System (MHSS) 2020 project to forecast changes in healthcare delivery, with the goal of facilitating the integration of these future health care practices into the design of the MHSS” (U.S. GAO, 1996a, p. 13). The project was started to identify 25-year trends in clinical and non-clinical technologies to determine how they may impact the MHS. The U.S. GAO suggested, “The compatibility of DOD’s future military medical system with current efforts is unknown” (p. 13). The 1996 *Annual Defense Report Readiness Report* (OSD, 1996) stressed medical readiness is the cornerstone of the Military Health Services System (MHSS) and emphasized that the MHSS supports the full array of military missions, including MRCs [major regional conflicts], lesser contingencies, humanitarian assistance, and disaster relief. The Office of the Secretary Defense elaborated that:

A key component of medical readiness is the experience acquired through real-world operational support missions... the Department provided medical support to numerous peacekeeping and humanitarian support operations around the world. These missions include maintaining a 60-bed deployable medical systems hospital...; medical support to the NATO Implementation Force...; providing care in support of migrant operations...; medical support in [several other nations]. Among the humanitarian assistance missions supported this past year were humanitarian aid...; support to other government agencies...; and numerous humanitarian and civic action projects around the world, relying heavily on Reserve components. The Department also provided medical support to domestic assistance/action missions in the continental United States. Operations include [disaster] assistance following the bombing of...and the Reserve component's Arch Angel medical training and support program. (OSD, 1996, Chapter 4)

The U. S. GAO (1996a) testified in September, if the predicted number of casualties had occurred in Operation Desert Storm, the medical units were likely understaffed and inadequately supplied to provide adequate care. This testimony also found the MHS was not prepared to support the evacuation of casualties from the combat theater or receive large numbers of chemically contaminated casualties. Significant problems identified included large numbers of non-deployable medical personnel, lack of required skills, lack of training for wartime missions, and inadequate or missing equipment and supplies. During its review of DOD's development, management, and implementation of its MRSP 2001, the U.S. GAO found the DOD was properly focused and coordinating reengineering efforts. It also noted, "Each service initiated a reengineering program to reassess and reconfigure its wartime medical capabilities to be more compatible with plans for two major regional conflicts and operations other than war" (p. 2). The testimony found expert panels focused on assessment of medical capabilities, organizational changes, operational changes, modularity, mobility, flexibility, communications technology, information systems, telemedicine, and periodic readiness training. This report also presented the creation of mobile forward surgical teams, specialty augmentation teams, and critical care aeromedical evacuation transport teams. Lastly, the U.S GAO reported the addition of nuclear, biological, and chemical (NBC) warfare; operations other than war (OOTW); and research and development (R&D) to the Medical Readiness Strategic Plan.

1997. Although the initial strategic plan for the MHS was published in 1995, it was revised in 1997 to incorporate initiatives from the MHSS 2020 project. The 1997 revision outlined six goals to prepare the MHS for the future: (a) joint medical readiness, (b) benchmark [integrated] health system, (c) healthy communities, (d) resources and structure, (e) training and skills development, and (f) technology integration. This revision (ASD(HA), 1997) broke out the

concept of health and fitness into a separate goal, emphasizing the importance of health and fitness in the overall system of care. Emphasis was also placed on readiness through utilizing joint operations and reserves, wellness versus illness, managed care growth, transition from specialty care to primary care, technology and business improvements, outcomes measurement, planning, resourcing, and mission changes. An important presentation within this strategy is the emphasis on prevention and wellness as the foundation of the system and promotion of evidence-based disease prevention and decision making to enhance population health. Other details include the establishment of effective and efficient organizations to support the readiness and benefits mission and training medical personnel for roles in peace and war. An anecdotal distinction is the word *Services* was dropped from Military Health Services System in recognition that health as a desired outcome, encompasses much more than just the provision of services. From this point forward, the enterprise is officially referred to as the Military Health System.

Matheny, Keith, Sundstrom, and Blood (1997) from the Naval Health Research Center claimed, "Military medical readiness for combat deployments requires pre-positioning the necessary medical treatment facilities (MTFs) and casualty evacuation assets within the theater of operations" (p. 2). Matheny et al. elaborated that medical readiness for ground combat operations depends on accurate casualty estimates, determination of bed requirements, and assessments of the evacuation assets required for transport the injured through the medical system. This report, along with others, presented medical planning tools aimed at calculating and forecasting hospitalization, evacuation, and logistical demands of future combat scenarios. Enacted in 1997, Public Law 105-85 required the Department of Defense to establish a system to

assess the medical condition of Service members before and after deployment (U.S. GAO, 2003a). This placed certain emphasis on immunizations and health-related documentation.

1998. The ASD(HA) published the *Medical Readiness Strategic Plan: 1998-2004 (MRSP 2004)* as a revision of the 1995 MSRP and prescribed procedures to achieve and sustain medical readiness through 2004 and beyond. Considering a reduced force and budget, the MSRP 2004 acknowledged that changes in the foreign and domestic policy of the U.S. where the U.S. now supported humanitarian and domestic assistance as an additional mission would have a significant impact on the medical community. The medical readiness vision of MSRP 2004 established “the military medical departments exist to support their combat forces in war and peacetime, to maintain and sustain the well being of the fighting forces in preparation for war.” Although titled “Medical Readiness Strategic Plan” the revision introduced and defined the pursuit of Force Health Protection (FHP) as:

A unified and comprehensive strategy that aggressively promotes a healthy and fit force and provides full protection from all potential health hazards throughout the deployment process. Its major ingredients include health and fit force promotion, casualty and injury prevention, and casualty care and management. (ASD(HA), 1998. p. 9)

FHP is a comprehensive strategy to protect Service members from health hazards associated with Military Service that relies on the MHS for successful implementation. It requires comprehensive healthcare that targets health and fitness to establish optimal physical and emotional well being for Service Members and their families. The MSRP 2004 added four functional areas to improve medical readiness: Military Operations Other Than War (MOOTW), Nuclear, Biological, and Chemical (NBC) Defense, Research and Development (R&D), and Preventive Medicine. Key concepts advancing medical readiness the MSRP 2004 were: (a)

identification of the medical threat, (b) scenario-based medical organizations and systems, (c) training of medical units and personnel, (d) training of non-medical personnel in medical subjects, (e) medical research, (e) health surveillance, (f) preventive medicine, (g) medical information systems, (h) inter-theater patient evacuation, (i) communication, (j) contingency health support, (k) forward medical support, and (l) definitive health support. The MSRP 2004 also specified medical systems and organizations may be used to provide healthcare to other eligible beneficiaries when not employed in preparation and training for their wartime role. 1998 also witnessed the establishment of the Defense Medical Readiness Training and Education Council designed to develop doctrine and coordinate medical force interoperability and integration (Coleman, 2001).

1999. In February 1999, the MHS Reengineering Coordination Team comprised of the Deputy Surgeons General from the three Services and the Deputy Executive Director for TRICARE Management Activity (TMA) developed the *MHS Optimization Plan* “to support development of a comprehensive and integrated health services delivery system” (DOD, 1999, p. 1). The plan describes the rationale for supporting the two symbiotic missions of readiness and the health benefit. This reengineering effort started with determining staff levels to meet the readiness mission and declared a shift from intervention services to preventing injury and illness, improving the health of the entire population, and reducing demand for tertiary treatment services. Two priority tasks were to determine the ideal standardized model for individual readiness and determine the cost of readiness.

In a position paper, Teft (1999) presented the elements of a health system that delivers health promotion and preventive medicine to describe the transition of the MHS to Force Health Protection, a prevention model. Teft recognizes that health maintenance does not solely occur in

the medical setting but also involves intervention at the work site and in the environment. Programs reviewed included: tobacco prevention and cessation, physical fitness, nutrition, stress management, alcohol and drug abuse prevention, communicable disease prevention, chronic disease prevention, and injury prevention. Teft affirms the success of a prevention model requires understanding the interrelationships in the system and incorporation of interventions at all levels. He supports that information systems capable of documenting care and outcomes is fundamental to a successful evidence-based prevention-oriented health delivery system. With the promise of reducing costs while improving health, Teft stresses that leadership, communication, and collaborative partnerships among various organizations at various levels can establish a healthy population and healthy community.

In an effort to operationalize the numerous constructs associated with medical readiness, McRae-Bergeron et al. (1999) focused attention on individual readiness issues. McRae-Bergeron et al. proposed a Medical Readiness Model of Health Assessment utilizing physiological, psychological, socio-cultural, and spiritual elements. The purpose of the model was to assist the military medical leadership in describing individual medical readiness through the constructs of state of well-being, personal interactions, mood, anxiety, and social support. The homeopathic perspective differed from antecedent studies of medical readiness that primarily focused on allopathic, equipment, and organizational aspects of readiness. Though initially limited in scope to the U.S. Air Force, practical application has gained widespread acceptance within the Uniformed Services. Simultaneously, Popper et al. (1999) emphasized that individual readiness could be measured through individual inputs of physical fitness necessary to meet operational contingencies and challenges.

2001. In its audit report of the *1999 MHS Optimization Plan*, the DOD Inspector General (2001) recommended the Under Secretary of Defense for Personnel and Readiness, in conjunction with the ASD(HA), determine the best organizational structure for implementing a MHS-wide personnel distribution process. The DODIG further recommended establishing a methodology for allocating personnel during peacetime, regardless of military department affiliation. In response, the Services and ASD(HA) stated, “readiness requirements are Military Department specific and are the initial consideration when allocating healthcare providers” (DODIG, 2001, p. ii). The departments noted that recent events (e.g. September 11, 2001) demonstrated the need for quick transition to wartime medical posture and the importance of ready and available medical staff. The U.S. Air Force non-concurred with the DODIG’s recommendations, stating:

First, each Service needs to define its overall Readiness mission. Each Service then needs to define the requirements needed to support that mission. The structure of the MHS does not need to change to accomplish this....As these missions are being clearly defined, the Services need to clarify an MHS-wide strategy and methodology for allocating these readiness resources during peacetime. These methodologies will have to be based on objective readiness needs (as defined above), clinical currency..., and business case analysis (Department of the Air Force, 2001., p. 2).

In their study on *Reorganizing the Military Health System*, Hosek and Cecchine (2001) state the MHS has two missions: the readiness mission and the benefits mission. The readiness mission is “To provide, and to maintain readiness to provide medical services and support to the armed forces during military operations.” The benefits mission is “To provide medical services and support to members of the armed forces, their dependents, and others entitled to DOD

medical care" (p. 2). The two missions are linked in two ways. The benefits mission provides TRICARE that maintains the health of Service personnel and family members needed for military effectiveness. Second, the same medical personnel are used for both missions sustaining necessary skills during peacetime for utilization during military operations. To meet the demands of both missions, the MHS has operational medical units to accomplish the readiness mission and military treatment facilities (MTFs) and managed care support contracts to accomplish the benefits mission. In their study, Hosek and Cecchine found that each Service was organized and structured differently to accomplish its missions citing differences in chain of command, financial management, and personnel management.

Hosek & Cecchine (2001) additionally highlighted the tasks required to balance the two missions because they draw upon the same personnel resources. Therefore, as requirements increase to support the readiness mission the effectiveness of the benefits mission may decline. Conversely, if the readiness mission is not currently engaged the MHS cannot reduce its personnel requirements without adversely affecting the benefits mission. This conundrum remains one of the cornerstone challenges of the MHS. Drawing from the same personnel resources also requires medical personnel to be capable of performing both missions, equipped with the necessary training, skills and knowledge to perform the readiness and benefits missions. Hosek and Cecchine declare medical personnel must possess medical training, clinical experience, military training, and military experience to successfully support both missions. "In total, these attributes constitute the essential components to maintain medical readiness" (2001, p. 44). The authors differentiate education, training, and experience into formal, on-the-job, general, military-specific, clinical, and special. Examples are residencies, treatment of NBC contaminated casualties, mass casualty management, aviation medicine and undersea medicine.

This study also underscores the impact of information, leadership, and doctrine on medical readiness citing difficulties with resource allocation, participation in humanitarian and disaster relief, and orchestrating health service support in joint medical operations.

Ray and Turkel (2001) reviewed the impact of TRICARE on total medical readiness. The authors suggested, "Readiness is dependent on a healthy total force and the response of military medical services." They further suggested that the healthy total force is directly related to the medical readiness of the individual, whereas the response of military medical services relates to organizational readiness. "The perplexing issue with this definition is that the proposition is somewhat tautological as the terms individual health and unit readiness cannot be distinctly measured exclusively within each unit of analysis without including measures and metrics from the recursive unit also" (Coppola, Cuyler & McMahon, 2005).

2002. In 2002, the ASD(HA) cancelled its 1995 publication titled *Military Medical Readiness Skills Training*, and reissued DOD Instruction 1322.24 to redefine medical readiness training requirements. The new policy stated "training must encompass all aspects of medical support in combat, humanitarian, and homeland defense contingencies and medical personnel must be able to provide health service support in all types of environments" (p. 2). This policy advanced concepts of initial, sustainment, specialty-specific, and mission support medical readiness training.

In March 2002, the ASD(HA) provided an overview statement of the MHS to the Personnel Subcommittee, Committee on Armed Forces, U.S. Senate, asserting:

The MHS program benefit provides an essential and interdependent link between medical readiness and everyday healthcare delivery. Meeting the force health protection responsibilities of the MHS depends on upon the success of TRICARE in providing both

quality healthcare and challenging clinical experiences for military healthcare providers (ASD(HA), 2002a, p. 3)

The statement described an integrated system of uniformed, civil service, and contract medical personnel working together to improve health for all beneficiaries around the world. The ASD(HA) further discussed the connection of new benefits, initiatives, and missions to providing healthy communities in support of readiness through improved quality of life, cost savings, and best practices. This statement expressed the importance of recruitment, retention, information systems, surveillance, tools, training, and collaboration with other organizations to accomplish the mission.

Coppola, Hudak, and Gidwani (2002) examined factors affecting unit and individual readiness within the military. Coppola et al. used the Army Medical Department motto of “*conserve the fighting strength*” (e.g., maintaining soldiers wartime ready and fit-to-fight), as a proxy definition for military medical readiness. However, the emphasis of this article centered on available capacity to treat both active duty personnel and Medicare Eligible Military Beneficiaries (MEMB). The article identified potential access issues through a forecasting model, and posited that active duty readiness might be affected by MEMBs seeking to gain care in authorized facilities as a result of the Tricare for Life legislation. Coppola et al. theoretical proposition was supported by a 2003 report that suggested that at any given time more than half of the individuals identified within the combined Armed Forces may not be fully medically ready (U.S. Government Accounting Office, 2003). However, to compound matters further, the concept of “ready” was applied inconsistently from Service to Service. This finding is also supported by another U.S. GAO (2003b) study that suggested inconsistencies in the manner in which the Navy, Army and Air Force catalogue ready reserve and active duty personnel.

2003. The GAO (2003a) found force health protection and surveillance processes were lacking and detrimental to medical readiness in a 2003 audit. The GAO found missing health assessments, missing medical record documentation of immunizations and screenings, and noncompliance of centralized data collection. Later, a document was published by the ASD(HA) that identified six essential Individual Medical Readiness (IMR) elements of overall readiness. The medical readiness elements were identified by a Joint Service working group of senior leadership. The goal was to align metrics with the Military Health System's strategic objectives. The IMR initiative included the following measures: periodic health assessments, deployment-limiting conditions, dental readiness, immunization status, laboratory studies, and individual medical equipment. In a process improvement initiative the ASD(HA) also established tracking and reporting requirements for each measure.

Coppola (2003) examined military medical readiness issues associated with the organization (i.e., hospital) level of analysis. This study was supported by data supplied by the ASD(HA). In this analysis, 78 U.S. Army, Navy, and Air Force medical centers and medical activities were examined for factors affecting organizational efficiency from 1998 through 2003. Organizational efficiency was defined as a quotient of selected inputs and outputs calculated through a data envelopment analysis methodology. Organizations with a high ratio (i.e., 100%, or approaching 100%), were suggested to possess a high degree of operational readiness. The study found that the Air Force, as a Service, was more medically ready than Army and Navy medical organizations.

In an address about medical readiness, the ASD(HA) strongly endorsed joint solutions to improving medical readiness (2003). He further endorsed far-forward surgery, essential care in theater, and more mobile field hospitals while emphasizing increased reliance on aeromedical

evacuation as large definitive facilities would be replaced with lighter, more agile and responsive treatment facilities.

2004. The Office of the Secretary of Defense published the first *Force Health Protection Capstone* document in 2004. The Health Service Support Division (HSSD), under the Joint Staff Logistics (J-4) directorate is responsible for the integration of health service support and readiness. According to the Joint Staff, the division is in place to, "help insure a healthy and fit force, protected throughout the operational spectrum, ready to meet the challenges of the new millennium." The Joint Staff created a capstone document that focused on Force Health Protection, defined as "A unified strategy that protects service members from all health and environmental hazards associated with military service." The document synthesized two years of work completed by 11 working groups to present a joint vision for the future of military medicine. The goal of the FHP is to provide a fit and healthy force when and where that force is required; while simultaneously reengineering medical forces. Although the focus of FHP is casualty prevention, the capstone outlines aspects of a total life cycle and emphasizes fitness, preparedness, preventive measures, improving monitoring and surveillance of forces; enhancing Service members' and commander's awareness of health threats; and supporting the healthcare needs of the fighting forces and their families across the continuum of medical services. The FHP capstone requires the MHS to reorient military medical forces from services that emphasize post-casualty intervention to proactive, preventive services deigned to prevent injury and illness.

The ASD(HA) subsequently published DOD Directive 6200.4, *Force Health Protection*, to establish policy and assign responsibility for implementing Force Health Protection for all Service members during active and reserve service (2004). The policy refined the Medical

Readiness Strategic Plan- 2004 (1998) definition of Force Health Protection (FHP) and formally defined FHP as:

All measures taken by commanders, supervisors, individual Service members, and the MHS to promote, protect, improve, conserve, and restore the mental and physical well being of Service members across the range of military activities and operations. These measures enable the fielding of a healthy and fit force, prevention of injuries and illness and protection of the force from health hazards, and the provision of medical and rehabilitative care to those who become sick or injured anywhere in the world (ASD(HA), p 11).

Force Health Protection requires DOD components to “program resources, develop doctrine, organization, training, materiel, leadership, education, personnel, and facilities” (ASD(HA), 2004, p. 6) to implement programs and processes that are capable of achieving the following outcomes: (a) promote and sustain a healthy and fit force, (b) prevent injury and illness, (c) protect the force from health hazards, and (d) deliver the best possible medical and rehabilitative care the sick and injured in the world. Specific programs and initiatives include: injury prevention, dental health, good nutrition, tobacco use prevention and cessation, physical fitness and weight control, responsible sexual behavior, stress management, suicide prevention, alcohol and drug abuse prevention, and other health initiatives. The policy requires health assessments and wellness interventions, administration of immunizations and other preventive therapies, safe and healthy working conditions; mitigating industrial, occupational, operational, and environmental hazards; and use of personal protective equipment and measures. Force Health Protection (ASD(HA), 2004) requires the Military departments to “employ flexible, modular, scalable, and interchangeable medical capabilities, logistics systems, and information

system to deliver the best possible medical and rehabilitative care to support military operations" (p. 4). The policy also addresses and specifies medical operational requirements regarding initial care, forward resuscitative care, health and medical services, evacuation and transport, hospitalization, and rehabilitative care.

2005. Ruble (2005) reported concerns regarding the health and physical readiness of the Reserve force. Ruble contends the Reserve population may place more demands on medical care and administrative processes as a result of being an older population. In response to the growing reliance on the Reserve component, TRICARE Reserve Select coverage became available in April 2005 for certain Reserve members and their family members (Association of Military Surgeons of the United States, 2005).

2006. In its Quadrennial Defense Review (QDR), the ASD(HA) published its *Roadmap for Medical Transformation* providing the current status of reviewing medical readiness and echoing conditions prompting this research. The QDR initiatives include: (a) establishing the Medical Readiness Review; (b) improve interoperability and agility of operational medicine capabilities; (c) align MHS capabilities to meet DOD requirements for Homeland Defense, civil support, and medical civil support operations; (e) define standards and resource requirements for a healthy, enhanced, and protected force; (f) prepare health care leaders to succeed in joint, performance based environments, including both Force Health Protection and beneficiary care missions; (g) shaping the future joint medical force; (h) integrate graduate medical education; (i) transform the infrastructure; and (j) transform the business. In his August 2004 memorandum establishing the Medical Readiness Review (MRR), the Under Secretary of Defense for Personnel and Readiness directed that "the MRR will systematically review the Military Health System (MHS) and provide recommendations to the Deputy Secretary of Defense for

transforming the MHS to meet the medical readiness requirements of the future" (2006, p. 5).

According to the ASD(HA), significant efforts are aimed at identifying health services requirements needed to meet the military's transformation goals to determine: wartime casualties, capabilities, resources, and the size of the active duty medical force. The ASD(HA) provides the current status:

Currently, the MHS is organized to support military forces during military operations and to provide beneficiary health care from fixed military treatment facilities (MTFs). At present, the scope of the requirements for support to Homeland Defense and other missions is unknown because the MHS' role in these operations has not been fully defined and analyzed. The DOD *Strategy for Homeland Defense and Civil Support* requires the MHS to be capable of responding to situations involving mass casualties and chemical, biological, radiological, nuclear and high-yield explosive (CBRNE) materials. The *Strategy* also requires that the MHS ensures the force protection of its facilities and supports humanitarian assistance and disaster relief requirements. This initiative calls for actions to define the mission of the MHS in these areas, conduct a capabilities-based analysis to determine MHS mission requirements for these areas, and, finally, incorporate the resulting requirements into the MHS (2006, p. 7).

As of April 3, 2006, the review has generated revised estimates and subsequent recommendations of conventional wartime requirements and is currently reviewing requirements associated with scenarios involving Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives (CBRNE) and Homeland Defense scenarios. The ASD(HA) states, "MRR will complete its analysis in time for the FY 2008 Program Review" (p. 5). The report lends additional support to the need for a common operating picture claiming:

In the past, the MHS capabilities largely represented the sum of independently developed Service programs, resulting in reduced interoperability and interdependency. Current military strategies mandate that the medical force structure be more responsive in diverse operations, to include capacity-building in the civilian public health sector and providing health care to host nation personnel, DOD contractors, and other civilians. Without compromise to Service-unique missions, these capabilities must be developed jointly and optimized to support joint health service operations across the entire ROMO [Range of Military Operations] (ASD(HA), 2006, p. 6).

In July 2006, the Task Group on Military Health System Governance, Alignment, and Configuration of Business Activities was formed to independently and objectively assess the organizational structure and best business practices that support strategic objectives of the MHS (Defense Business Board, 2006). In its report to the Secretary of Defense, the task group noted past and current reorganization objectives were aimed at improving medical readiness through better planning, training, and operational systems and noted that the MHS has identified core processes to enhance medical readiness of all forces and facilitate seamless operational medicine. Recommendations included establishing a unified medical command and combining the management and execution of all like shared services, personnel, logistics, education, training, information technology, contracting, facilities; and research, development, testing, and evaluation (RDTE) in order to establish common requirements. Other recommendations were to establish enhance partnership with Veterans Affairs and align resources to promote implementation, accountability, and transparency.

2007. The ASD(HA), Dr. Winkenwerder, formerly stated:

The Surgeons General of the Army, Navy, and Air Force and I are fully committed to the philosophy that the health and well being of our fighting forces extends to the care wellness of their family members, retirees, and their family members. These beneficiaries are integral to the readiness mission and to the recruitment and retention of Soldiers, Sailors, Airmen, and Marines (TRICARE, 2006, p.1).

The ASD(HA) solidified this commitment in *The Military Health System Strategic Plan* (2007) that outlines a strategy to deliver: a fit and protected force, protection from injuries during military operations, satisfied beneficiaries, healthy communities, and a world-class health benefit within reasonable costs. The MHS Strategic Plan is founded on three pillars: (a) provide a medical ready and protected force and homeland defense for communities, (b) create a deployable medical capability that can go anywhere, anytime, with flexibility, interoperability, and agility, and (c) manage and deliver a superb health benefit. The priorities are reflected across stakeholder perspectives and recognize the importance of shaping an integrated seamless health system to balance these expectations. Specific stakeholder perspectives are depicted in Figure 2, the MHS Strategy Map.

In an effort to summarize the many objectives of medical readiness, Coppola, Harrison, Kerr, and Erckenbrack (2007) assert readiness is associated with maintaining the health status of active duty personnel well above the health standing associated with non-military personnel. Furthermore, the authors found readiness is synonymous with ensuring efficient supplies are available for national disasters and war, and ensuring that appropriate processes are in place to support mobilizations. This means that readiness is associated with the ability of certain elements of brick and mortar healthcare facilities to become mobile and deploy worldwide when necessary. Finally, readiness is concerned with operations management processes and the

efficient and effective use associated with the transformation of inputs into outputs. This perspective of military medical readiness solidly captures many of the elements and objectives presented over the previous decades.

Individual Medical Readiness.

The Department of Defense (2006b) established six independent metrics, measured against standards established in DOD Instruction 6025.19, to determine individual medical readiness (IMR). IMR metrics provide leaders and primary care managers, across all Uniformed Services, the ability to monitor the medical readiness status of their personnel. Through recording and reporting by unit and medical personnel, medical elements are available for evaluating individual medical readiness. The IMR module of the Medical Protection System (MEDPROS) enables commanders to determine availability of individual Service Members, units, and task forces by providing visibility on the medical readiness of each command (Department of the Army, 2006, p. 121). The Medical Protection System (MEDPROS) reports the number and percentage of Service Members available from the total force, by unit, installation, or Service. MEDPROS counts and compares the number of members reported as compliant with medical readiness requirements. Prior to deployment, the DOD performs health assessments to ensure that only medically fit military personnel deploy in support of operations. The assessment confirms and documents a Service Member's health readiness status and identifies any need for additional clinical evaluation prior to deploying (Assistant Secretary of Defense for Health Affairs, 2005).

The six IMR metrics are: Immunization Status, Lab Studies, Dental Status, Deployment Limiting Conditions, Individual Medical Equipment, and Periodic Health Assessments (PHA). As a function of the six independent IMR variables, the overall IMR of each Service member is

assessed as (a) fully medically ready, (b) partially medically ready, (c) not medically ready, or (d) medical readiness indeterminate. According to DODI 6025.19 (2006b), fully medically ready is defined as current in all categories including dental class one or two. Partially medically ready is defined as lacking one or more immunizations, readiness laboratory studies, or medical equipment. Not medically ready signifies the existence of a chronic or prolonged deployment limiting condition (per Service-specific physical standards guidelines), including Service Members who are hospitalized or convalescing from serious illness or injury, or individuals in dental class three. Lastly, the inability to determine the Service Member's current health status because of missing health information such as a lost medical record, an overdue health assessment or being in dental class four will result in the classification as "medical readiness indeterminate" (2006b, p. 4). Key standards for each individual medical readiness element are also established in DOD Instruction 6025.19:

Immunization Status. Immunizations effectively prevent infectious diseases in the deployed as well as non-deployed environments. Immunizations are monitored by unit and medical personnel for compliancy. Members current for Total Force/All Services vaccines including hepatitis A, tetanus-diphtheria (Td), MMR, IPV, hepatitis B (if series began) and influenza (once per season) are considered deployable; members overdue for one or more immunizations are unavailable.

Medical Readiness Laboratory Studies. DOD requires current HIV testing and a DNA sample on file in the Armed Forces Repository of Specimen Samples for the Identification of Remains (AFRSSIR). "Military Department or Service-specific policies may identify additional readiness lab tests such as Glucose-6-phosphate dehydrogenase or hemoglobin S (sickle) testing, but they are not part of the DOD core-reporting element" (DOD, 2006b). Service Members with

a HIV test result on file, within the past 24 months, and a DNA sample on file with the AFRSSIR are considered deployable. Personnel with one or more deficiencies are not deployable.

Dental Status. For dental readiness, all Services use the same classification system to assess and monitor dental readiness. Personnel with dental class of one or two per current annual dental exam are available, while members with dental class of three or four are considered unavailable. Members with a current dental examination, who do not require dental treatment or reevaluation are class one and are considered worldwide deployable. Members with a current dental examination, who require non-urgent dental treatment or reevaluation for oral conditions, which are unlikely to result in dental emergencies within 12 months are considered class two and are available for worldwide deployment. Patients who require urgent or emergent dental treatment are classified as class three and are normally not considered to be worldwide deployable. Personnel who require periodic dental examinations or patients with unknown dental are class four and are considered unavailable for deployment. Leaders must recognize that a dental classification of four indicates the annual exam is overdue or the dental record is missing which may be quickly corrected. For the purpose of IMR reporting, an exam is overdue if it is not accomplished within three months following the due month.

Deployment Limiting Conditions. “There are many examples of deployment-limiting conditions such as pregnancy, asthma, severe traumatic injury with incomplete rehabilitation, etc” (DOD, 2006b, p. 9). Deployment limiting conditions are defined by Service-specific policies. Members with no deployment limiting conditions are medically qualified for deployment. Members with a deployment limiting condition are not medically ready for deployment.

Individual Medical Equipment. For personnel subject to deployment, medical equipment will be monitored as appropriate. The core requirement is one pair of gas mask inserts (GMI) for all deployable assets needing visual correction. Service-specific policies may identify additional items of medical equipment, such as two pair of prescription spectacles, hearing aid batteries, etc., but they are not part of the DOD core-reporting element.

Periodic Health Assessments (PHA). An assessment for changes in health status, especially changes that could impact a member's ability to perform military duties is required on a periodic basis. Service-specific requirements for currency and methodology of periodic health assessment have been defined. Members with a current PHA are considered medically ready. Members with an overdue PHA are not medically ready. According to DOD, the PHA is overdue if not accomplished within three months following the due month.

Analysis and Findings

Expected Findings

Using grounded theory as the strategy to guide this study, the goal of this study is to propose a conceptual model for medical readiness. Grounded theory has specific steps that involve generating categories of information through open coding, selecting and positioning the categories within a theoretical model, and then elucidating the relationships among categories. From a large number of sources spanning 27 years of military medicine in various contexts, the author expected to discover themes and relationships within the data that could be extracted and organized to represent the constructs of military medical readiness.

Analysis

Using the inductive process, key components of medical readiness were extracted from documents and analyzed for themes. Although not all uncovered attributes are represented,

Figure 3 presents the inductive logic of categorizing data into thematic codes. Selected documents were optically scanned for key words that communicated a function, feature, characteristic, attribute, process, or goal that provided insight into what comprises the MHS. Selected text was highlighted and then later entered into an electronic spreadsheet to develop a list of unique properties for coding. Unique characteristics were recorded until the author established codes capable of capturing and categorizing all characteristics and felt that the literature was redundant with new categories no longer emerging. After preliminary reading and analysis, with some tentative coding, themes of data began to emerge and it became apparent that each unique word could not realistically be captured without consuming an unreasonable amount of time due to the vast number of synonyms used. For example: training, knowledge, skills, abilities, competence, proficiency, and experience would frequently be used interchangeably. The following example illustrates this point, "personnel must acquire the right skills." This passage was interpreted as training in that the member must complete training in order to acquire the skills. As research continued patterns began to reveal themselves as themes such as personnel, equipment, and training. Themes were subsequently organized and codes were "developed" from the themes to create categories. Creswell (2003) defines coding as the process of taking text data or other material and labeling categories with a term, often based in the actual language of the participant. Codes were identified based on their ability to represent a conceptual domain and encompass other attributes while adequately using MHS stakeholder language. For example although supply could be its own code so could equipment; however, materiel is a more encompassing concept that is also recognized by military leaders and logisticians as including equipment and supplies. Table 3 presents codes and operational definitions. At some point during the research, the author realized that structures, processes, and outcomes adequately

captured all coded domains and began additionally labeling concepts as structures, process, or outcomes. After recognizing that structures, processes, and outcomes were capable of capturing all concepts the author contemplated the application of these domains as theoretical constructs.

Findings

Although the phrase medical readiness is often used, only one formal definition was discovered during this research. This denotation appeared to differ from the connotative use in many reports. The author contends that military medical readiness is not just a metaphor but a valid knowledge construct. Although a metaphor may serve as a useful heuristic and may serve as a precursor to theory, Bacharach (1989) maintains a higher standard is required of constructs in that they “must sufficiently tap the domain of the phenomenon in question” (p. 507).

According to Kaplan (1964), constructs are terms which, though not observational either directly or indirectly, may be applied on the basis of the observables. Hence, constructs are the building blocks of theory construction.

After analyzing documents related to medical readiness it is determined that medical readiness goes beyond just a metaphor but is indeed a “broad mental configuration of a given phenomenon” (Bacharach, 1989, p. 500). Using data extracted from a large source of documents, the author developed a grounded theory by interrelating categories of influence on medical readiness. The research produced hundreds of unique attributes that were adequately categorized into 15 themes. These themes were subsequently explained by three constructs that represent military medical readiness. Figure 4 suggests a theoretical model of medical readiness.

During the research, themes began to emerge which produced the following categories: (D)octrine, (O)rganization, (T)raining, (M)aterial, (L)eadership, (P)ersonnel, (F)acilities, (C)ommunications, and (R)esults. “DOTMLPF is a problem-solving construct for assessing

current capabilities and managing change" (Department of the Army, 2005, ¶ 4-4). These are viable categories applicable to the Military Health System as the Joint Staff (2000) reports, "The products of analysis, modeling, simulation, and joint experimentation support the development of recommendations for change...in the areas of concepts and doctrine, organizational design, education, and training, ... leader development, materiel, personnel, and facilities" (p. VIII-5). Purportedly, change deliberately executed across these elements enables improvement of capabilities. Although these domains captured the majority of selected attributes, it was apparent that certain characteristics (goals, objectives, communications, information management, etc.) required codification. At this stage the author selected and added C4I for command, control, communications, computers, and intelligence; and R for results, goals, objectives, and outcomes.

Coding led to numerous categories which required examination for possible reduction. Guba (1978) suggests looking for recurring regularities that can be sorted into categories. Categories should be evaluated for internal homogeneity which ensures the data logically belongs to the category and external homogeneity where it is clear that the categories are clearly different from one another. In an attempt to reduce the total list of attributes, topics were examined for relationships and familiar grouping. When examined, the author felt that the DOTMLPFC categories could be adequately represented as structures and proved to be antecedent to the results domain. It then became apparent that results (goals and objectives) could be represented as outcomes and all characteristics and categories could be represented by structures, processes, or outcomes. Thematic analyses of coded categories ultimately categorized codes into three constructs: structures, processes, and outcomes.

Just as identifying the attributes of medical readiness and ascribing operational definitions are important in advancing the concept of medical readiness, categorizing the

attributes is important for measuring indicators. This study proposes that all attributes of medical readiness may be classified within three domains proposed by Donabedian: (a) structures, (b) processes, and (c) outcomes. According to Donabedian (1980), structures combine with processes to produce outcomes. Structure refers to the attributes of the settings in which healthcare is delivered. The Board on Health Care Services (2006) considers structures as both the physical and organizational aspects of the organization such as materiel resources, human resources, and organizational structure. Characteristics such as facilities, education, training, staffing, equipment, patient census, and organization are categorized as structures (HCS, 2006). Processes denote what is actually done to the patient in the deliver of care (HCS). Processes are those actions created by management and refined by workers (Donabedian, 1980). Ransom, Joshi, and Nash (2005) speculate that all components of clinical activities are considered processes. Components of how care and services are provided such as assessment and evaluation, diagnosis, therapeutic interventions, and palliative interventions are considered processes. Deming (1995) however, contends that “every activity, every job, is part of a process.” Outcomes are defined as “the direct result of a patient’s health status as a consequence of contact with the health care system” (HCS, p. 172). Other indicators that typically capture whether goals were achieved are also outcomes. Although outcomes are most often associated with how the care affects health, status, functionality, and well-being, Iezzoni (2003) reasons that outcome measures include costs of care as well patients’ satisfaction.

The domains presented by Donabedian have broad application and are well-established in healthcare quality forums. Applied to the examination of medical readiness, it appears to sufficiently capture all attributes. Furthermore, the structure and process domains are accurately antecedent to the progenitor outcome domain reflecting the same relationship that exists between

doctrine, organizations, training, materiel, leadership, personnel, facilities, C4I, and processes to the goals (outcomes) of the MHS. The author argues that similar to Donabedian's model of quality where outcomes are affected by structures and processes, the military structure of the MHS resources and facilitates medical processes that affect readiness outcomes. The author argues that Donabedian's domains are general enough to fit a large number of empirical situations and presents a mental model of relationships between the three constructs. The findings of this study suggest that Donabedian's domains for evaluating quality may be a theoretical model of relationships that have wider application to other constructs such as medical readiness.

Proposed Definition of Medical Readiness

“Intuitively, readiness is, and has always been military medicine’s reason for existence” (Bedsole, 1996, p. 3). However, it appears that the meaning and components of medical readiness has changed over the course of the last decade and differ based on perspective. Instead of defining medical readiness solely as a set of traits, the proposed definition uses the model’s domains to represent subordinate traits. At its broadest level, medical readiness may be defined as “military structures that facilitate medical processes that affect health outcomes.” The author proposes a more formal definition, defining military medical readiness as, “The coordination of military structures (doctrine, organization, training, materiel, leadership, personnel, and facilities) and medical processes to promote, improve, and maintain a healthy and fit force, deployable medical force, healthy communities, and quality healthcare to all eligible beneficiaries across the full range of operations.” The author believes this definition addresses the operational and institutional missions and incorporates previously defined medical readiness

and force health protection objectives while communicating the domains that represent all the identified properties and variables discovered during research.

Validating Findings

Shanks, Tansley, and Weber (2003) recommend that stakeholders validate the model to ensure it faithfully represents the construct it is intended to represent. Shanks et al. offer that a valid model will: (a) accurately represent the semantics of the focal domain as perceived by the stakeholders, (b) completely represent the semantics of the construct, (d) semantics will not contradict one another, and (e) will not have redundant semantics.

Several strategies were implemented to ensure the internal validity of the findings. First, multiple documents from multiple sources were triangulated to examine congruent agreement of data among the sources. Second, the author had external members with knowledge of the MHS check the accuracy of the categories, inferences, and model. Third, a narrative was presented to convey the dependent relationships between structures, processes, and outcomes which logically appear to be coherent. Fourth, an external auditor, familiar with modeling techniques and the Military Health System, reviewed the entire project for credibility. Lastly, the author objectively reviewed the data and findings from a participatory role to ensure all characteristics and relationships were presented. These safeguards do not guarantee the accuracy of the model but assure the reader that generally acceptable methods were used in examining medical readiness.

Medical Readiness Model

Model

According to literature, mental models come about to simplify complex phenomenon. Visual models aid in establishing a holistic picture of the phenomenon, program, or process (Creswell, 2003). In reviewing the literature, the objective was to detect key attributes and

categorize concepts where feasible. The model attempts to communicate endogenous constructs and their relationships. Figure 5 reflects medical readiness as a theoretical model by identifying the constructs of medical readiness using the established criteria. The model borrows from previous research in model development to establish the association between the constructs (Boyd, 1990; Levine & White, 1973; Zinn, Weech, & Brannon, 1998). Conceptually, the model suggests that medical readiness of the MHS is a function of military structures, medical processes, and readiness outcomes. Consistent with the principle that all key outcomes should be measured, healthcare leaders must select representative indicators for each variable and operationally define measures for evaluating relationships among variables. Figure 6 depicts a more comprehensive conceptual model with some suggested variables and metrics as observable representations of each construct presented in Figure 5.

Military Structures

The military structures domain of military medical readiness is an antecedent construct to the medical processes construct as processes cannot be performed without doctrine, training, personnel, equipment, facilities, etc. By measuring each of the variables within military structures, the MHS can assess its structure to evaluate its resources to provide military medicine. For the purpose of consistency, all examples provided are organic to the U.S. Army and may easily be substituted with equivalent Navy and Air Force examples.

Doctrine. “Medical doctrine exists to provide a framework to develop and refine tactics, techniques, and procedures for effective medical support extending from the most forward American service member at risk through the Continental United States base” (ASD(HA), 1995, p. 7). As a military structure, doctrine provides the direction and boundaries for medical readiness. Doctrine directly affects medical readiness by mandating requirements, establishing

standards, forecasting milestones, authorizing resources, prescribing procedures, and placing constraints on the readiness process. Hosek and Cecchine (2001) affirm several functions are coordinated by doctrine such as patient admission, patient movement, and reimbursement practices. Examples of doctrine include: laws, regulations, policies, plans, procedures, operation manuals, training directives, technical instructions, and memorandums of agreements. Some suggested metrics that represent doctrine are budget, resource authorizations, and compliance with legislation, regulations, policy, and guidance. As a readiness structure, plans are necessary doctrine to identify, coordinate, and prepare personnel, equipment, and training to successfully execute tasks according to doctrine. Adequate plans must consider operational requirements, mission-specific requirements, unit-specific requirements, contingency requirements, peacetime requirements, and domestic support requirements. Competent plans will evaluate mission requirements against historical data and situational awareness to coordinate structures and processes necessary to accomplish the mission. Doctrine is essential in balancing the distribution of resources between the readiness mission and benefits mission. The importance of thorough plans is evident in many recent events such as the military's medical response to Operation Enduring Freedom, Operation Iraqi Freedom, domestic Anthrax attacks, and Hurricane Katrina. In reality, the Military Health System identified resources and requirements to support these events years before the actual occurrence by planning to support a variety of missions in a variety of locations and conditions. Metrics to assess doctrine may include the number of "plans" current according to doctrine. For example, fixed facilities are required to review their Emergency Management Plan annually. If the plan has not been reviewed and approved within the last year, the facility would be considered deficient in medical readiness.

Organization. The organization variable represents “the configuration of the hierarchical levels and specialized units and positions within an organization” (Rainey, 1997, p. 170). Within the MHS, organization includes those structural entities, levels, and positions that implement TRICARE and deliver health care to its beneficiaries. The organization domain consists of government and non-government organizations (NGOs) that influence or partner with the MHS. Organization also includes the structure of an entity such as the hierarchical arrangement of a system. Within the government agencies there are Department of Defense (DOD) and non-DOD entities. Within the DOD, four hierarchies comprise the Military Health System (National Defense Research Institute, 2002). The Office of the Secretary of Defense (OSD) and the three military Services each oversee a set of health providers that deliver health care. Responsibility for TRICARE contracts resides with OSD’s Health Affairs. The Army health system is organized as the Army Medical Department (AMEDD), the Navy health system is organized as the Bureau of Medicine & Surgery (BUMED), and the Air Force health system is organized through the Air Force Surgeon General. Each health system has overall authority and responsibility for ensuring the health readiness of its Service personnel and delivering healthcare to its military personnel and other beneficiaries. Within each health organization various elements comprise a system such as medical, dental, behavioral, preventive medicine, veterinary, evacuation, ancillary services, and support services. Organization also includes internal and external relationships as well as international and domestic partnerships such as NATO, Veterans Affairs, Department of Homeland Security, Fisher House Foundation, etc.

Another indicator of the military’s organization to deliver healthcare is the capability to medically transport patients in peacetime and during all operations. DoD’s ability to move patients across different echelons, theaters, and Service platforms during peace and conflict is

vital to its readiness. Given this essential function, the medical organization must consist of a measurement of its evacuation assets. Metrics offered for evaluation are number of ground evacuation units, number of aero evacuation units, number of ground platforms (wheeled ambulances, tracked ambulances, amphibious ambulances, etc.), and number of aero-evacuation platforms (fixed wing aircraft, rotary wing aircraft).

Training. Training proved to be the most discussed and analyzed domain of medical readiness and consists of many components. In 1996, DOD defined its training infrastructure as billeting, mess facilities, classrooms, equipment, software packages, and instructors used to provide, facilitate, or support training of the military forces. Training is currently defined as “instruction and applied exercises for acquiring and retaining skills, knowledge, and attitudes required to complete specific tasks” (USD(P&R), 2004, p.10). There are essentially three types of training: unit training, civilian, and formal training and education for military personnel (U.S. GAO, 1996c, p. 1). Training is the structure that creates, maintains, or improves proficiency of knowledge, skills, and abilities. It also prepares the force to learn, improvise, and adapt to constantly changing threats in addition to executing doctrine to standards (USD(P&R), 2004a). Training is an essential function to meet the challenges of delivering medical care across the range of military operations. Maintaining qualified medical personnel and medical systems that have the skills, knowledge, abilities, and experience to deliver healthcare makes the medical readiness mission unique. To support readiness across the spectrum of operations, medical personnel must complete medical *and* military training while acquiring clinical *and* military experience (Hosek & Cecchine, 2001). Training includes both formal and informal education and experience. In the proposed model, the following metrics are offered as indicators of training: collective training, proficiency in supporting tasks, staff training, leadership training, individual military-specific training,

individual skill-specific training, formal education, informal education, experience, physical training, and cognitive training (Assistant Secretary of Defense for Health Affairs, 2002).

“Collective training is instruction and applied exercises that prepare an organizational team to complete required tasks as a unit” (USD(P&R, 2004, p. 10). Collective training is multi-echelon training on tasks prescribed by doctrine or assigned by commanders that directly support missions and require the “collective efforts” of many MHS components in order to achieve success. Providing health support in the theater of operations is an example of a task that would be trained on collectively. The task requires planning, coordination, and execution of tasks by several organizations, at several levels. Each collective task has several supporting tasks that sub-units (organizations) must perform in order to successful accomplish a collective task. Providing preventive medicine support in a theater of operations is an example of a supporting task that directly contributes to the collective task of providing health support in a theater of operations. In providing preventive medicine support, a preventive medicine team would train on this task in support of the military health system providing health support for the theater. The bridge to readiness is that the MHS is not “ready” to provide health support in a theater of operations unless the preventive medicine team is trained and “ready” to provide preventive medicine support in a theater of operations. Similarly, both individual general training and individual skill-specific training directly contribute to the readiness of the Military Health System being prepared to provide health support. For example, if members of the preventive medicine team are not proficient in water sampling, the ability of the preventive medicine team to provide comprehensive preventive medicine support is jeopardized, which in turn places the Military Health System at risk of providing health service support in a theater of operation.

Military medical personnel must complete the same clinical training as their civilian counterparts (Hosek & Cecchine, 2001). Medical readiness training (MRT) is defined as “courses, hands-on training programs, and exercises designed to develop and enhance survival skills and maintain military medical skills. MRT includes individual, collective, and unit training, both initial and sustainment, required to ensure healthcare personnel and units are capable of performing operational missions” (ASD(HA), 2002, p. 8). Therefore, metrics are easily established in measuring availability and readiness of medical personnel by measuring the number of personnel trained by classification, skill, grade, credentials, and qualification in each specific measure. Similarly, the training readiness of medical organizations can be assessed by the number and type of training completed against established standards. Leaders must plan, prepare, execute, record, and report training to ensure the readiness of medical organizations and medical personnel. The military measures and reports training status of personnel and units using the Status of Resources and Training System (Smith & Petersen, 1997).

To maintain readiness among medical personnel, medical organizations must maintain a case mix that allows medical personnel to maintain proficiency in their medical skills through clinical experience while they are assigned to the MTF. Likewise, medical personnel must understand the military context where they provide care. Ensuring medical personnel the opportunity to gain experience in deployable medical organizations should lead to more effective care during deployment operations through understanding the injuries and illnesses associated with that operational environment (Hosek & Cecchine, 2001). The readiness of medical personnel and medical units sometimes requires a specific set of specialized medical skills. In addition to collective, supporting, and individual training, specialized training must also be accomplished to ensure readiness. For example, medical organizations charged with ensuring the

medical readiness of undersea or aviation personnel requires medical personnel with special skills prepared to deliver healthcare in support of those members. These specialized skills must be maintained at all times to support medical readiness.

Additional metrics available for assessment are physical, cognitive, and simulation training exercises. With these supplemental training metrics, leaders can modify the training status of an organization through evaluating the number of physical, cognitive, and simulation exercises completed. Physical exercises are drills actually performed by the organization that generally evaluates the organization's ability to execute a given task with mobilized resources; whereas cognitive exercises are those simulation readiness training exercises that test the ability to respond to a sudden crisis using only existing, locally available resources (Von Lubitz et al., 2004). Examples of these training exercises are deployment readiness exercises, mass casualty drills, notional table-top exercises, full-scale drills, High Fidelity Patient Simulators (HFPS), and virtual reality exercises.

Materiel. Materiel consists of the medical and non-medical logistics, equipment, and supplies essential to delivering healthcare. DOD (2006a) defines materiel as:

All items (including ships, tanks, self-propelled weapons, aircraft, etc., and related spares, repair parts, and support equipment, but excluding real property, installations, and utilities) necessary to equip, operate, maintain, and support military activities without distinction as to its application for administrative or combat purposes.

The research, development, acquisition, transportation, storage, and distribution of these logistics are instrumental in providing the tools necessary to deliver care. The importance of this function is self-evident as history is rife with disastrous examples as a result of failing to provide medical supplies and equipment from lack of basic supplies and instruments to shortages of

vaccines. Examples include capital expense equipment, vehicles, diagnostic and testing devices, beds, monitoring devices, sets, kits, outfits, personal protective equipment (PPE), blood, pharmaceuticals, reagents, etc. Metrics are easily established for materiel by assessing current availability against required and authorized levels. For example, if a MTF is required to have 10 surgical sets but only has nine available, its availability for surgical sets is 90%. Leaders must make every effort to identify those items *essential* to performing the medical organization's mission and ensure that proper levels are maintained. Leaders should direct future efforts toward establishing baseline data to measure against current levels as an indicator of readiness.

Leadership. House defines leadership as "the ability of an individual to influence, motivate, and enable others to contribute toward the effectiveness and success of the organizations of which they are members" (2004, p. 15). Leadership is "influencing people by providing purpose, direction, and motivation while operating to accomplish the mission and improving the organization" (Department of the Army, 1999). Leadership provides a vision, creates culture, builds teams, instills will, enforces values, makes decisions, prioritizes tasks, drives excellence, and strives for improvement. Leadership may be formal or informal, by virtue of position or other means. Examples are climate surveys, performance improvement metrics, disciplinary metrics, and task completion metrics.

Personnel. Manning the Military Health System demands an accurate identification of the required people with necessary skills and experience. Personnel are "those individuals required in either a military or civilian capacity to accomplish the assigned mission (DOD, 2006a). Personnel also encompass the structures necessary to recruit, assign, retain, and manage human resources. Personnel metrics provide an assessment of a medical organization's ability to sufficiently perform its functions based on the personnel available compared against the number

of personnel required and authorized. Personnel metrics can be measured as a number or percentage of personnel assigned/available by classification (commissioned officer, warrant, non-commission officer, enlisted, government civilian, and contractor) or skill (clinical, support, ancillary, and administrative). Currently, Services can report manning percentages as specific as the number of available members by occupational specialty (e.g. orthopedic surgeon, emergency room nurse, radiologist technician, patient administrative specialist, physical therapist, etc.).

Facilities. An important dimension of military structures is its medical treatment facilities (MTFs). DOD (2006a) defines a facility as “a real property entity consisting of one or more of the following: a building, a structure, a utility system, pavement, and underlying land.” A medical treatment facility is defined as “a facility established for the purpose of furnishing medical and/or dental care to eligible individuals” (DOD, 2006a). These facilities provide a regular, reliable, and recognizable entity for patients to present for treatment and clinicians to practice and deliver medical care within the Military Health System. According to Hosek and Cecchine (2001), MTFs supply about two thirds of the health care used by TRICARE beneficiaries (as measured by the number of visits) and almost all the care used by active duty personnel. MTFs may be further distinguished as institutional or operational. Institutional MTFs are defined as facilities designed to deliver medical care, constructed of “brick and mortar.” Institutional MTFs include large, medium, and small facilities. For the purpose of the proposed model, large facilities are defined as facilities capable of providing comprehensive scope of services (primary, secondary, tertiary, specialty, outpatient, and inpatient). A medical center, and its equivalent, would qualify as a large facility. Medium institutional facilities would include a community hospital and its equivalent. Medium MTFs historically provide a wide scope of services but have some limited services such as certain specialty capabilities. Usually referred to

as clinics, small institutional facilities are defined as those facilities that provide only ambulatory or primary outpatient care. In a variety of combinations, institutional MTFs provide the locations for the MHS to deliver the benefits mission and ensure Service members are compliant with medically-related deployment requirements. Metrics for institutional facilities may be specified and expanded to include number of staff, number of services provided, number of enrolled beneficiaries, access data, number of physicians per population, or number of hospital beds, by type, etc.

Operational MTFs may be defined as medical organizations and systems designed to deliver medical care *and* are capable of deploying worldwide. These facilities provide the location to deliver care during military operations. Similar to institutional facilities, operational MTFs may be large, medium, or small. A large operational MTF may be defined as being able to deliver level three health service support in the theater of operations (e.g. combat support hospital and its equivalent). Medium facilities would be those capable of providing level two health service support (e.g. medical company and its equivalent). Small facilities are organic to operational units and have limited capabilities but are able to provide level one health service support (e.g. unit aid station and its equivalent). Because deployments present additional medical challenges for the Military Health System as Service Members are exposed to foreign flora, battle fatigue, disease, enemy fire, etc., the MHS also creates special operational medical organizations capable of providing specific medical missions. These organizations may be defined as those that have limited personnel to complete a specific health mission. Preventive Medicine (PM) teams, Forward Surgical Teams (FST), Combat Stress Control (CSC) teams, and Civil-Medical Action Teams (CMAT) are examples of special operational medical organizations. Suggested metrics for operational MTFs may include the number of available operational MTFs,

number of units or personnel the facility can support, number of services available, number of staff, number of beds, etc.

Command, Control, Communications, Computers, and Intelligence (C4I). C4I are the integrated structures necessary to send, receive, store, control, analyze, and transform information. The following definitions are provided by the *DOD Dictionary of Military Terms* (2006a). Command has many aspects; it is “the authority that a commander in the Armed Forces lawfully exercises over subordinates by virtue of rank or assignment” and includes “authority and responsibility for effectively using available resources for planning the employment of, organizing, directing, coordinating, and controlling military forces for the accomplishment of assigned missions.” Command also includes “responsibility for health, welfare, morale, and discipline of assigned personnel.” Control is the “authority that may be less than full command exercised by a commander over part of the activities of subordinate or other organizations” or “governing the distribution and use of documents, information, or material.” Communications are any “means or methods to convey information of any kind from one person or place to another.” Lastly, intelligence is defined as “the product resulting from the collection, processing, integration, analysis, evaluation, and interpretation of available information and information and knowledge about an adversary [or medical threat] obtained through observation, investigation, analysis, or understanding.” Examples include health record access and documentation, patient movement tracking, electronic immunization tracking, longitudinal records, data analysis, and execution of doctrine.

Medical Processes

Medical processes are those activities aimed to stabilize, restore, or improve health and function. “Process of care denotes what is actually done to the patient in the giving and receiving

of care" (Health Care Services, 2006). Military medical processes consist of four endogenous constructs: promotion, prevention, protection, and treatment.

Promotion. Promotion is the process to encourage and reinforce healthy behaviors and motivate beneficiaries to engage in managing their health. Promotion are those activities that identify and communicate relevant information and methods necessary to deliver, improve, and sustain a healthy and fit force, healthy communities, and quality care. Activities include education, programs, and partnerships with beneficiaries that motivate them to adopt healthier lifestyles. Examples include health assessments and feedback, health-awareness programs, patient education, compliance monitoring, outreach programs, etc.

Prevention. Prevention is the process that provides continuous, comprehensive medical surveillance to counter threats that may affect health. Prevention focuses on countering environmental and occupational health hazards. Activities include identifying, detecting, evaluating, controlling, minimizing, reducing, and removing physical and mental environmental and occupational risks. Examples include surveillance activities, serum collection, research and development of countermeasures, sanitation, counseling, and removing environmental and occupational hazards. DOD (2006a) defines surveillance as "the ongoing, systematic collection, analysis, and interpretation of data derived from instances of medical care or medical evaluation, and the reporting of population-based information for characterizing and countering threats to a population's health, well-being and performance." Metrics may include detection rates, warning rates, removal rates, "prevention" rates, aversion rates, containment rates, isolation rates, quarantine rates, sentinel indicators, accident rates, disease rates, and non-battle injury rates.

Protection. Protection is the process of providing countermeasures to deny the effect of detected (and perhaps undetected) hazards to in order to maintain and fit force and healthy

communities. Examples include prophylaxis, repellents, personal protective equipment and barriers, immunizations, vaccinations, water purification, sanitation and hygiene that counter the effects of unpreventable risks.

Treatment. Treatment consists of those intervention processes that stabilize, restore, and improve health and function to those entrusted to the MHS. Treatment consists of a continuum of care provided through first response, resuscitation, en route care, medical treatment, surgical intervention, hospitalization, and rehabilitation. Examples include: evaluation, diagnosis, clinical practice, therapeutic intervention, counseling, case management, disease management, and discharge planning. Metrics may include: encounter data, procedure data, return to duty rates, available service rates, utilization rates, lengths of hospital stays, hours of care, patient acuity, relative weighted products (RWP), relative value units (RVU), number by diagnostic related groups (DRG), number by international classification of disease (ICD), etc.

Readiness Outcomes

With the aim of achieving medical readiness, the outcomes construct provides a common set of expectations for the team to perform. The proposed model presents four desired outcomes of medical readiness: a healthy and fit force, deployable medical force, healthy communities, and quality care. In support of medical readiness, the Military Health System is expected to perform or support a variety of missions; as structures and processes are antecedent to outcomes, structures must be coordinated and processes executed to affect readiness outcomes.

Healthy and Fit Force. “Personnel in a healthy and fit force maintain and improve the health of their bodies and minds in a supportive environment” (OSD, 2004, p. 19). A healthy and fit force is mission ready and resilient. Fit and healthy forces are functional, productive, resistant to illness, and less prone to injury. Healthy and fit personnel manage stress and quickly recover

from injury and illness. A healthy mind includes cognitive, behavioral, emotional, and spiritual health. Indicators include physical fitness, dental fitness, injury prevention, illness and resistance. Theoretically, the health and fitness of the force is the aggregate of the individuals whose health and fitness is determined with assessment tools such as periodic health assessments and fitness evaluations. Indicators of a healthy and fit force may be obtained through health assessments, physicals, behavioral assessments, IMR compliance data, injury rates, illness rates, recovery rates, disability rates, diet preferences, and risky behavior occurrence rates.

Deployable Medical Force. A deployable medical force is capable of providing health services to support operational mission requirements. It has coordinated structures and processes to provide the continuum of health services across the full range of military operations. The coordination of structures and practice of processes results in a competent and available medical force, prepared to deliver healthcare in operational environments. Suggested metrics include: unit “readiness” rates, time from notification to deployment; number, type, and time of activities that require completion prior to deployment; time from point of injury to definitive care, died of wounds rates, unit sustainability rates (in theater), duration of support, number and type of services available, number and type of services provided, etc.

Healthy Communities. A healthy community is a healthy and supportive environment with healthy beneficiaries that lead healthy lifestyles and are resilient to environmental risks. Measures may include: Healthy People 2010 metrics, non-smoking rates, non-obese rates, healthy behavior indexes, exercise rates, alcohol consumption rates, disease management compliance rates, reduced patient visit data (emergency, outpatient, and inpatient), reduced hospital stays, pharmaceutical usage rates, etc.

Quality Care. “Military medicine has always aimed to provide the very best, the highest quality healthcare possible” (deLeon, Bailey, Soule & Sears, 2000, p. 8). The MHS aims to deliver the same standard and quality of care, regardless of the environmental context. The Institute of Medicine (2007) defines quality of care as, “The degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge.” The Agency for Healthcare Quality and Research states, “Quality is increasingly recognized as a product of systems....[and] should be measured and reported routinely” (AHRQ, 2006, p.1). Some recognizable indicators of delivering quality care are exceeding accreditation standards such as the performance standards established by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), medical management metrics such as the National Committee on Quality Assurance’s (NCQA) Health Employer Data Information Systems (HEDIS) measures, and evidence based practice metrics (e.g. clinical practice guidelines). Patient safety indicators such as infection rates, complication rates, medical error rates, and pharmacy error rates provide additional indicators of quality of care. Inpatient quality indicators may be measured through mortality rates and utilization rates. Other indicators include access metrics, satisfaction rates, benchmarking, rates of potentially compensable events, and positive health outcomes as perceived by the patient and provider.

Discussion

The purpose of this study was to develop a model of medical readiness using acceptable modeling criteria. The model was designed to be general but based on solid foundations of cognitive mapping and does not claim perfect foresight. The different perspectives of medical readiness served as an impetus for this research with a goal of providing a model to facilitate the convergence of understanding among stakeholders. Through reviewing the chronological

evolution of medical readiness and identifying key components, the author contends that medical readiness is a valid domain as observed by the three constructs: structures, processes and outcomes. However, Shanks et al. (2003) maintain that stakeholders must validate the model intended to represent that construct. Kuhne (2005) advises:

Communities can take surprisingly long time spans to come to an agreement what notions like “object” and “component” should be encompassing. Although such efforts can be tedious and are known to endanger research meetings to stall to the “definition-problem” already, they are necessary in order to enable communication among community members (p. 1)

Ransom, Joshi, and Nash (2005) assert that healthcare services can be characterized by a wide array of attributes and different stakeholders attach different levels of importance to particular attributes which leads to different definitions of healthcare services among stakeholders (p26). An application of the differences in definition-related concepts to the issue of medical readiness may reveal where some divergences occur. The author argues that various concepts arise among stakeholders when discussing medical readiness due to different conceptual models built from personal experiences and heuristics.

Given the theoretical framework and conceptual model presented in this article, the author suggests that military medical readiness is a function of the relationship between military structures, medical processes, and readiness outcomes. The proposed model presents a holistic approach to understanding and determining medical readiness by graphically presenting where various elements fit and how they affect other elements in the MHS. Specifically, the military structures (doctrine, organization, training, materiel, leadership, personnel, facilities, and C4I) facilitate the medical processes (promotion, prevention, protection, and treatment) which

consequently produce outcomes (healthy and fit force, deployable medical force, healthy communities, and quality care). For example, a MTF provides the Military Health System with a location and range of services that primary and specialty providers can deliver quality care to affect the health and fitness of Service Members and improve the health of the community. The structures are required in order to promote, prevent, protect and treat Service Members and other beneficiaries. Therefore, the structures must support the processes that yield desired outcomes.

The author argues military medical readiness is comprised of complex components and suggests determining derivative domains and establishing measurable indicators may assist in predicting the probability of a medical organization successfully accomplishing its mission. Although the Service medical departments generally employ similar readiness requirements, each Service defines and measures medical readiness differently. Adopting a shared conceptual framework serves as a compass for identifying the structures, processes, and outcomes that must be measured to determine the output required to attain “medical readiness.” Through collecting metric data on the variables proposed, responsible leaders can assess military medical readiness and determine where to allocate resources. Lastly, standardizing medical readiness variables will likely assist in the coordination and evaluation of joint medical interoperability and promote systemic efficiencies.

As consolidation of shared services is becoming prevalent in the healthcare industry (Defense Business Board, 2006) the MHS can also achieve benefits by examining its structures and processes to deliver optimal outcomes. Logically, as the MHS increasingly seeks to achieve economies and efficiencies during its transformation, it will wrestle with strategies to unify structures and processes. The author speculates that a congruent mental model will eventually emerge commensurate with the stages of Tuckman’s (1965) team development model. Using the

MHS as the unit of analysis, one may argue that each Service will elicit information about structures and processes during the forming stage. This period is often characterized by a period of uncertainty about the team's structure and purpose. Arguably, differences will be pronounced among Services as each attempts to shape perceptions of the tasks to be performed. As scrutiny of these perceptions begins, conflict leads to the storming stage until consensus begins to converge toward a team mental model and the team begins "norming" (Klimoski & Mohammed, 1994). The author proposes a neutral conceptual model may reduce some of anxieties experienced during the storming stage and provide a team mental model that may improve the organization's performance.

While collectively the phenomenon of medical readiness remains, understanding its operational concepts, structures, processes, and outcomes may assist in developing a common framework to align resources accordingly. With bounded rationality constraining our understanding to existing knowledge, the model can only represent what is currently known. The shared mental architecture may change over time due to changing inputs such as training, experience, and advances in technology. Therefore, healthcare leaders must remain cognizant of new and developing variables that may contribute to medical readiness.

Limitations

Qualitative research is fundamentally interpretive (Creswell, 2003). Therefore, this research must be embraced with the knowledge that documents were reviewed through the author's personal lens in a specific historical moment influenced by cultural factors. One of the most apparent limitations is the author's potential to commit errors of commission and omission. In an attempt to maintain objectivity, a tendency to be all inclusive may have resulted in the selection of certain attributes that are not relevant to medical readiness. Equally, the author's

judgment and experience may have influenced the selection of attributes and organization which may have resulted in omitting a fundamental concept. Qualitative software was not used and content analysis was conducted manually by reading the literature and extracting key attributes. Reviews are therefore subject to human error. Text searches were conducted to discover unique attributes and did count occurrence frequencies which some researchers feel lends support to the relative value of certain attributes.

Selection of government documents were drawn upon to acquire informed perspectives.

Although these perspectives are assumed objective, they are still considered selective perspectives. Ideally, interviews with experts should have been conducted. However, time constraints prevented developing interview protocols. This approach would have loosened the reliance on written material and perhaps shed light on non-documented attributes.

The time scope of this study is 1988 to 2007 where the end of the Cold War was taken as a starting point marking a strategic shift in how the MHS viewed and established medical readiness. Therefore, it is possible that concepts related to medical readiness prior to 1988 were not reflected but may be relevant now or in the future. Arguably, certain concepts are unknown to date and will reveal themselves in the future. Lastly, it should be noted that it was difficult to keep pace with the barrage of transformational changes that occurred within the MHS during this research; the MHS launched several lofty initiatives during this period.

Recommendations

The following recommendations are provided in efforts to establish a common framework and definition for understanding military medical readiness. First, the model should be examined by subject matter experts and leadership to determine the accuracy and validity of the model. Next, the model may be used as a communication tool to stimulate critical discussions

on medical readiness and begin establishing a common framework among stakeholders. Presenting a conceptual model will foster a team mental model of the structures, processes and outcomes required to achieve military medical readiness. Presenting the model at executive healthcare leadership forums and academic forums will likely stimulate critical discussion necessary to develop an improved model and definition. According to the Joint Chiefs of Staff (2000), educational and research institutions can have a significant role in preparing the Armed Forces of the United States. These institutions may serve as valuable sources of conceptual proposals for transforming the force and provide thoughtful collaboration for concept and force developments. The author proposes presenting the model in military institutional training environments to present the relationships among the domains for shareholders to appreciate the complexities of providing and maintaining medical readiness. This approach will also facilitate a common operating picture across the enterprise. The model also has potential domestic, multi-national, and ally application by providing a paradigm for understanding or developing a military health system. The model also offers the opportunity to conduct a comparative analysis with the medical readiness of other nation's military health systems to identify congruencies and variations. Third, healthcare leaders should explicitly define medical readiness and publish the definition; a clear definition will assist leaders in providing a common term of reference for determining and aligning structures and processes to achieve the desired outcomes. The MHS may consider using a Delphi-survey of stakeholders or conduct definition work-shops with subject matter experts to identify the components of the definition. Leaders should realistically assess the current level of medical readiness compared against expectations. Fourth, the MHS must define priorities of medical readiness for others to make harmonious decisions in support of medical readiness and create enterprise-wide measurements of medical readiness structures,

processes, and outcomes. Lastly, the MHS must monitor and communicate medical readiness through collecting and analyzing metrics of structures, processes, and outcomes. It is critical for the MHS to remain cognizant of new variables that may contribute to medical readiness. As structures, processes and outcomes change the MHS must develop and implement a systematic process for reviewing domain content.

To further this stream of research, additional analyses may be completed using content analysis methodologies to determine the most important (reported) factors of medical readiness. Several lessons learned and knowledge sharing databases have adequate material for a thorough analysis. Other directions include identifying appropriate measures of each domain and testing hypotheses to evaluate the theoretical validity of the model.

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Table 1

TRICARE Projections for Fiscal Year 2006

System Characteristic	Projection
Total Beneficiaries	9.2 million
Military Facilities-Direct Care System	
Inpatient Facilities (Hospitals & Medical Centers)	70 (52 in U.S.)
Ambulatory Medical Clinics	411 (309 in U.S.)
Ambulatory Dental Clinics	417
Veterinary Facilities	259
Military Health System Personnel	136,600
Military	88,400
Civilian	48,200
Total Unified Medical Program (UMP)	\$34.7 billion*

Source: Health Program Analysis and Evaluation Directorate, TRICARE Management Activity in the Office of the

Assistant Secretary of Defense (Health Affairs), *The FY 2006 Evaluation of the TRICARE Program* (p. 19).

* Includes direct and private sector care funding, military personnel, military construction, and Accrual Fund.

Table 2

Selected Literature Review of Medical Readiness Definitions

Medical Readiness Definitions, Descriptions and References			
Author	Year	Source	Definition, Description or Reference
Joint Staff	1983	Memorandum of Policy No 172 p.3	The ability of forces, units, technical systems and equipment to deliver the output for which they were designed.
Gordon et. al.	1983	Military Medicine	Readiness for war is recognized today as the primary mission of the medical departments of the Military Services
Yarrington, C.T.	1985	Military Medicine	Medical readiness is an illusionary term, dependent upon the time and environment in which it is used.
Nolan, D.L.	1988	Military Medicine	...[T]he term readiness can have several definitions.
Normile et al	1990	Military Medicine	Medical Readiness Training is of major importance in preparing to meet the challenge of medical care during wartime and national emergencies or disasters.
Health Affairs	1994	Medical Readiness Strategic Plan	Encompasses the ability to mobilize, deploy and sustain field medical Services; to support any operation requiring military Services; to maintain and project the continuum of healthcare resources required to provide for the health of the force and to operate in conjunction with beneficiary healthcare.
Popper et. al.	1999	Journal of Occup & Envir Medicine	Readiness is the ability to be medically qualified and physically fit for any locale and mission scenario.
Ray, M.A.	2001	Military Medicine	Mission readiness is dependent on a healthy total force and the response of military medical nursing Services...In the reserves, health care mission readiness relates to preparedness.
Coppola et al.	2002	Military Medicine	Readiness is defined as conserving the fighting strength
Coppola	2003	Dissertation Abstracts	Readiness is the effective and efficient operation of managing inputs through a process of obtaining satisfactory outputs.
Mulkey, S.L.	2004	Military Medicine	Readiness is the peacetime mission (health care to its beneficiary population) that prepares military providers for deployment.
DOD	2004	DOD Dictionary of Military Terms	The ability of US military forces to fight and meet the demands of the national military strategy.
Coppola et al.	2007	Essentials of Managed Care <i>Chapter 28: The Military Managed Care Health System</i>	Readiness is associated with maintaining the health status of active duty personnel well above the health standing associated with non-military personnel. Furthermore, readiness is synonymous with ensuring efficient supplies are available for national disasters and war, and ensuring that appropriate processes are in place to support mobilizations. This means that readiness is associated with the ability of certain elements of brick and mortar healthcare facilities to become mobile and deploy worldwide when necessary. Finally, readiness is concerned with operations management processes and the efficient and effective use associated with the transformation of inputs into outputs.

Note. From "A Proposed Composite Model of Military Medical Readiness by M. N. Coppola, M. Cuyler, and R.

McMahon, 2005, unpublished manuscript, Army-Baylor University at Fort Sam Houston, TX. Adapted with permission.

Table 3

Thematic Codes and Operational Definitions

Code	Construct	Definition
D	Doctrine	Data related to authorizing and prescribing beings, objects, events, or procedures
O	Organization	Data related to the existence and arrangement of entities
T	Training	Data related to developing skills, knowledge, abilities, and experience
M	Materiel	Data related to acquiring, maintaining, and distributing equipment and supplies
L	Leadership	Data related to direction, influence, and motivation
P	Personnel	Data related to acquiring and maintaining human resources
F	Facilities	Data related to physical settings and locations
C	C4I	Data related to authority, information, and management such as command, control, communications, computers, and intelligence
MP	Medical Processes	Medical activities intended to stabilize, improve, or restore health, well-being, and/or function
R	Results	Data related to goals, objectives, results, and outcomes (later transformed to outcomes)

Figure Captions

Figure 1. This model illustrates the structural components and relationships of a theory.

Figure 2. This figure presents Military Health System strategy map and stakeholder perspectives as desired outcomes.

Figure 3. This figure illustrates the inductive categorization of attributes into thematic codes and constructs.

Figure 4. This model illustrates the exogenous construct of Military Medical Readiness. This construct is supported by the endogenous constructs of Military Structures, Medical Processes, and Readiness Outcomes.

Figure 5. This model illustrates a theoretical model of military medical readiness with each constructs' subordinate variables and propositions between constructs.

Figure 6. This figure illustrates a conceptual model of military medical readiness and relationships among constructs and variables.

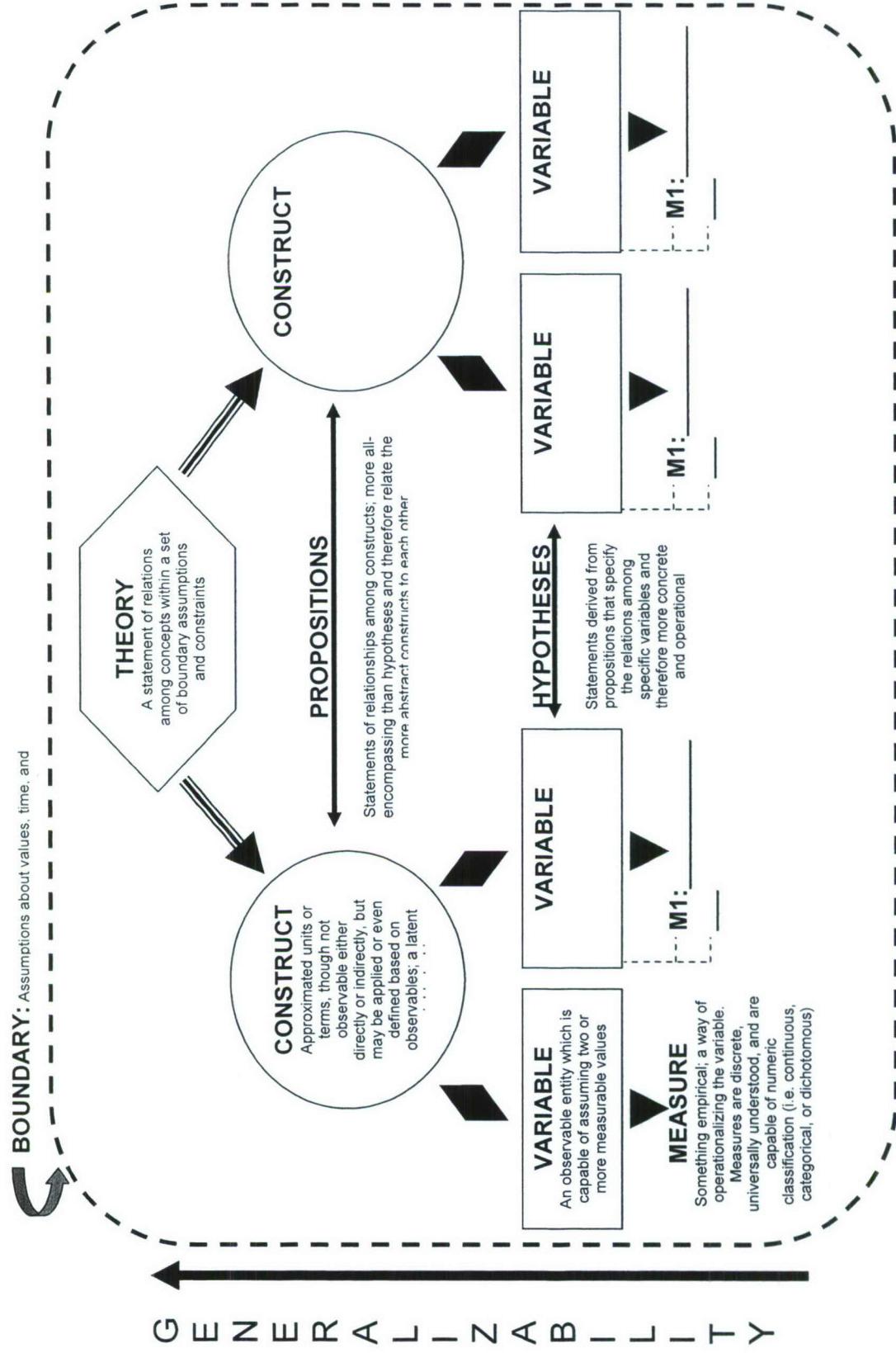


Figure 1. This model illustrates the structural components and relationships of a theory.

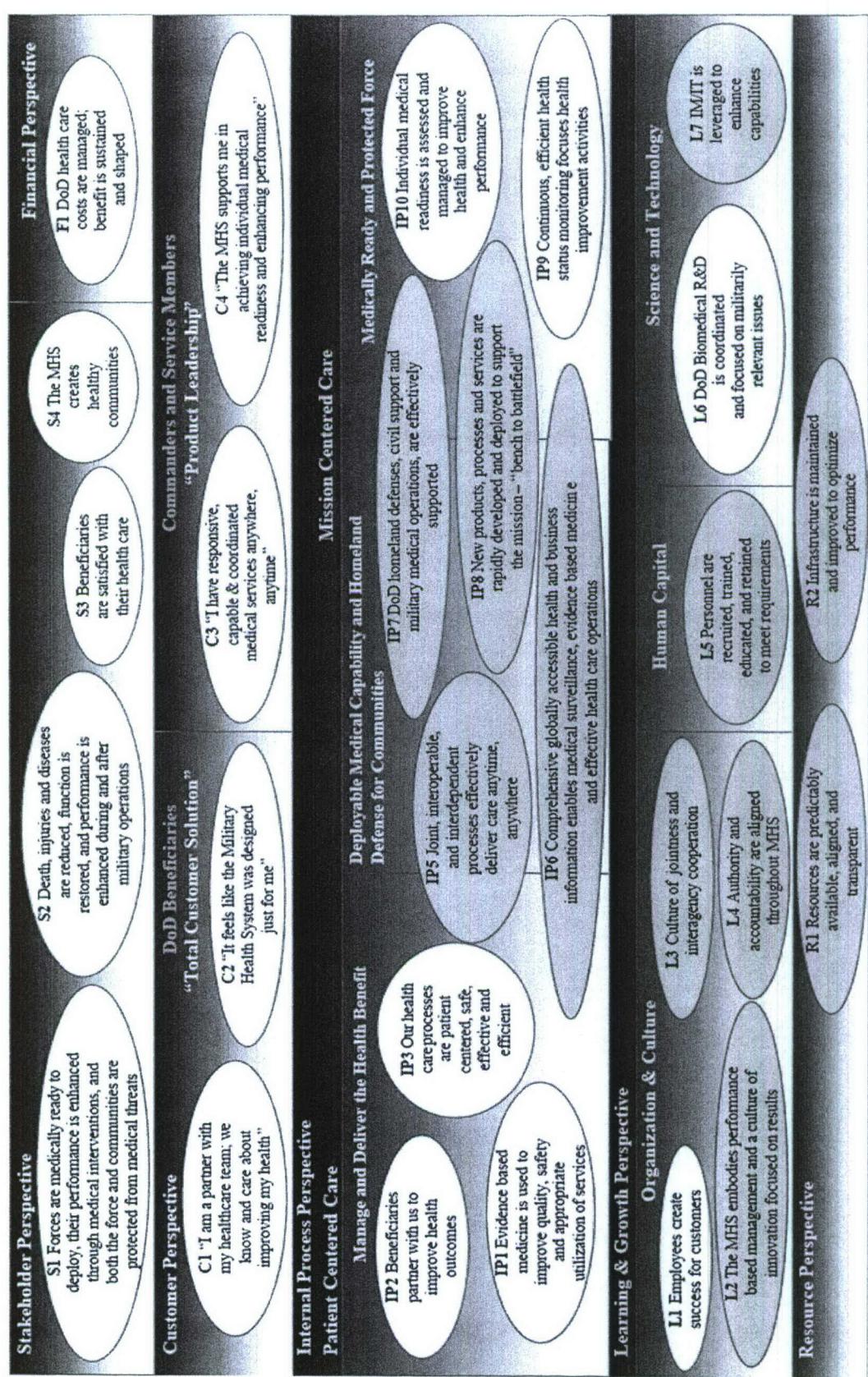


Figure 2. This figure presents Military Health System strategy map and stakeholder perspectives as desired outcomes.

From Assistant Secretary of Defense for Health Affairs (2006). Retrieved April 7, 2007, from http://www.ha.osd.mil/strat_plan/default.cfm

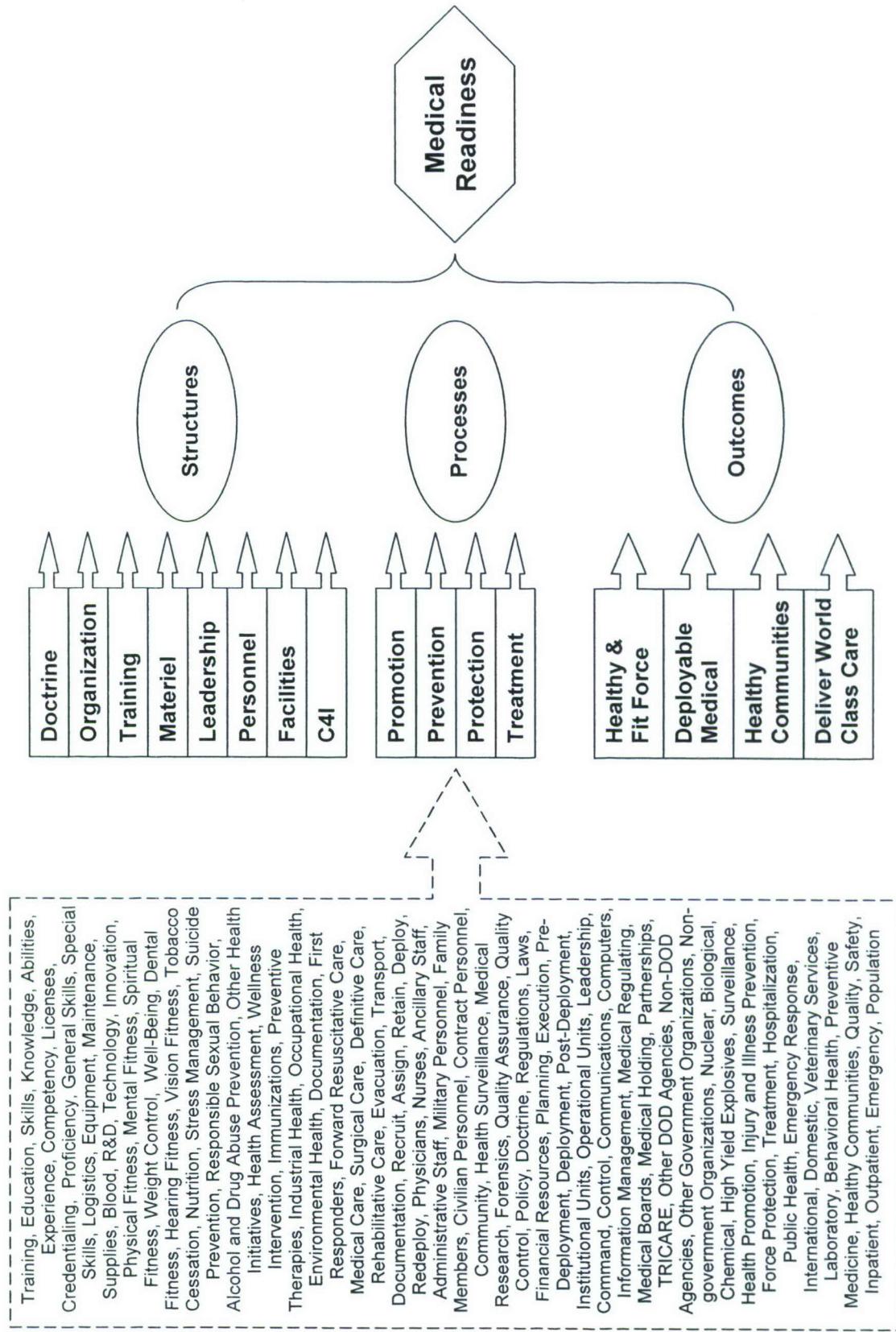


Figure 3. This figure illustrates the inductive categorization of attributes into thematic codes and constructs.

Note: All elicited data is not represented. The figure should not be considered a comprehensive list of all characteristics of military medical readiness.

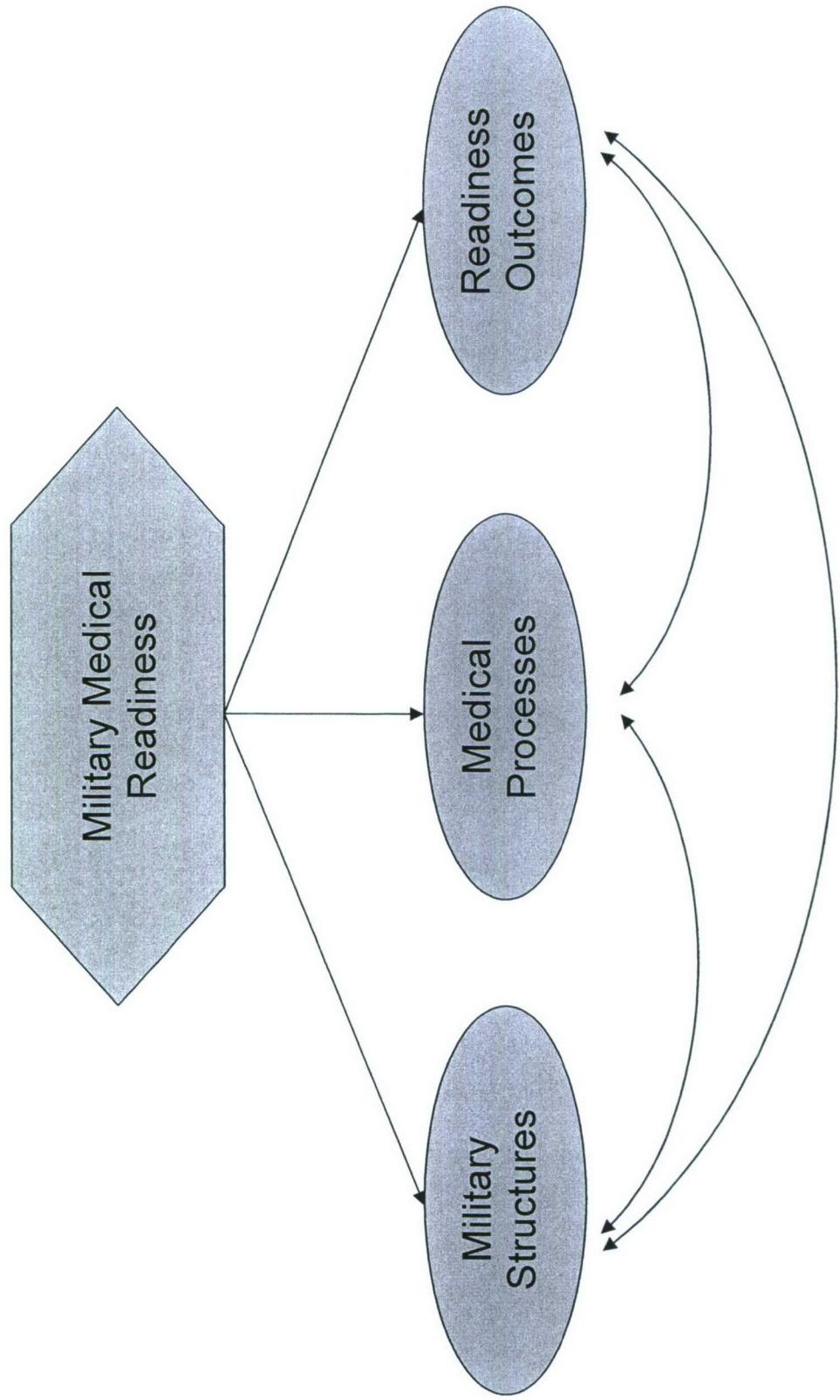


Figure 4. This model illustrates the exogenous construct of military medical readiness. This construct is supported by the endogenous constructs of military structures, medical processes, and readiness outcomes.

Note. From "A Proposed Composite Model of Military Medical Readiness by M. N. Coppola, M. Cuyler, and R. McMahon, 2005, unpublished manuscript, Army-Baylor University at Fort Sam Houston, TX. Adapted with permission.

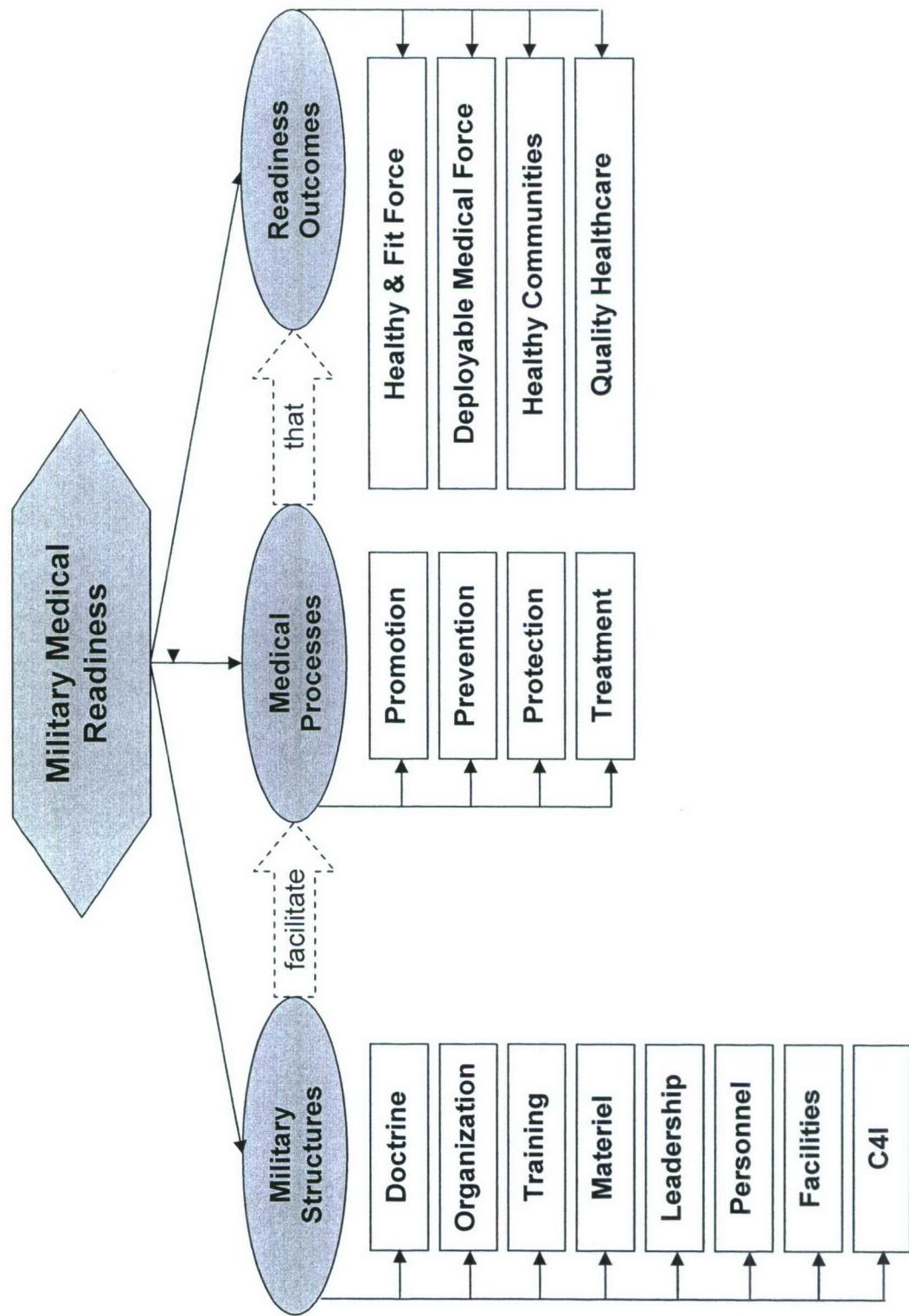


Figure 5. This model illustrates a theoretical model of military medical readiness with each constructs' subordinate variables and proposition between constructs

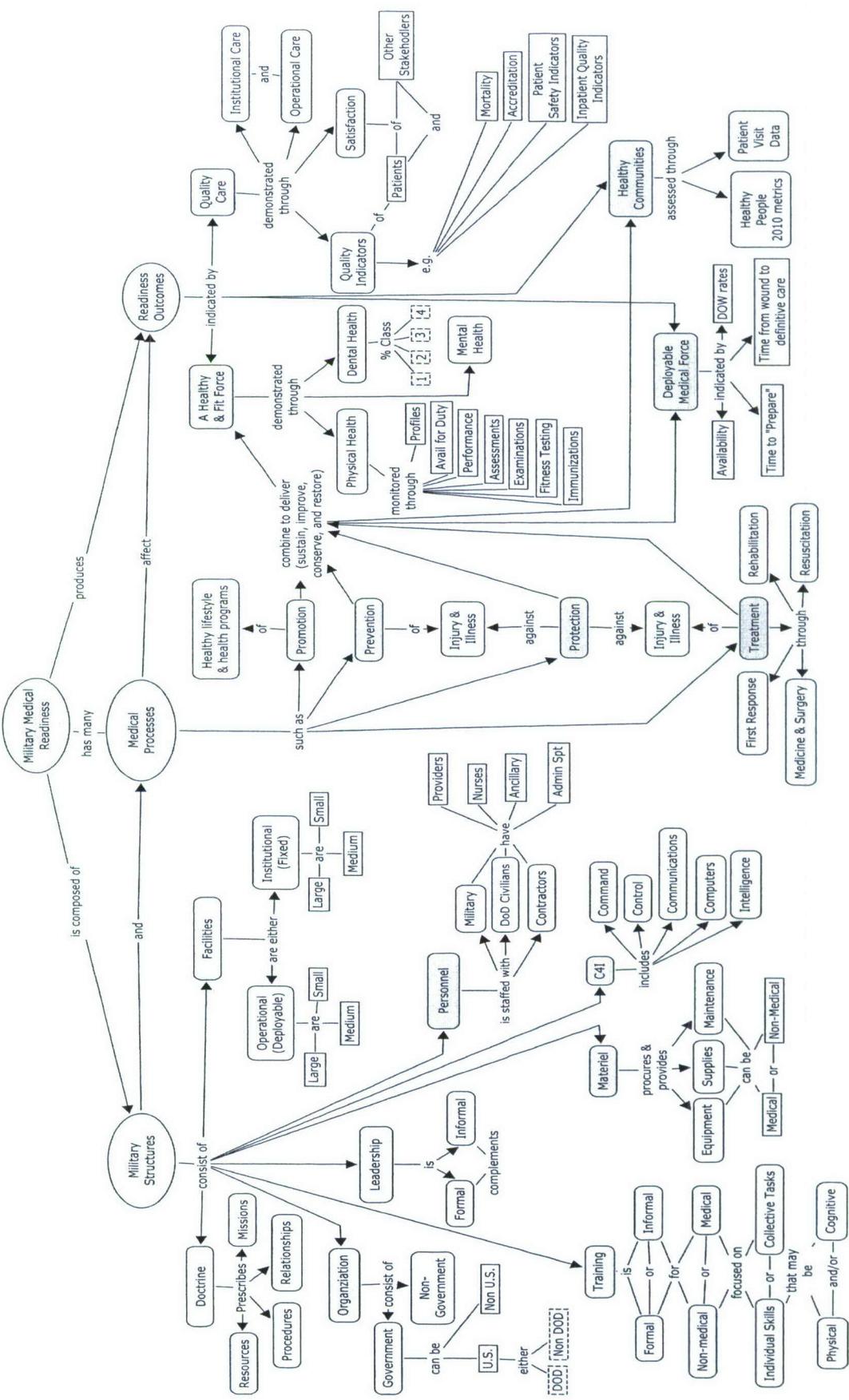


Figure 6. This figure illustrates a conceptual model of military medical readiness and relationships among constructs and variables.

Appendix A

Glossary of Definitions

Combat Readiness. Synonymous with operational readiness, with respect to missions or functions performed in combat. (DOD, 2006a)

First Responders. The primary healthcare providers whose responsibility is the provision of immediate clinical care and stabilization in preparation for evacuation to the next level of care. In addition to treating injuries, they treat Service members for common acute minor illnesses. These elements of medical management prepare patients for return to duty or for transportation to a higher level of care and may be conducted by self-aid, buddy care, combat lifesavers, medics/corpsmen/medical technicians, or paramedics. They also support disease and injury prevention activities.

DODD 6200.4, October 9, 2004

Force Health Protection. All services performed, provided, or arranged by the Services to promote, improve, conserve, or restore the mental or physical well-being of personnel. These services include, but are not limited to, the management of health services resources, such as manpower, monies, and facilities; preventive and curative health measures; evacuation of the wounded, injured, or sick; selection of the medically fit and disposition of the medically unfit; blood management; medical supply, equipment, and maintenance thereof; combat stress control; and medical, dental, veterinary, laboratory, optometry, medical food, and medical intelligence services. See also force; protection. (DOD, 2006a)

Health Service Support. All services performed, provided, or arranged by the Services to promote, improve, conserve, or restore the mental or physical well-being of personnel. These services include, but are not limited to, the management of health services resources, such as

manpower, monies, and facilities; preventive and curative health measures; evacuation of the wounded, injured, or sick; selection of the medically fit and disposition of the medically unfit; blood management; medical supply, equipment, and maintenance thereof; combat stress control; and medical, dental, veterinary, laboratory, optometric, medical food, and medical intelligence services. Also called HSS. (DOD, 2006a).

Health Surveillance. The systematic collection, analysis, and interpretation of information on the health of a population and relevant health hazards, with timely dissemination of feedback to those who need it and can take action. Comprehensive health surveillance provides actionable health-related information to military and medical decision-makers, allowing optimal incorporation of prevention and protection into training, plans, and operations. A military surveillance system includes a routine functional capacity for data collection, analysis, and dissemination of information linked to military preventive medicine support of operations and training. *DODD 6200.4, October 9, 2004*

Military Health System (MHS). A world-class health system that supports the military mission by fostering, protecting, sustaining and restoring health. It also provides the direction, resources, healthcare providers, and other means necessary for promoting the health of the beneficiary population. These include developing and promoting health awareness issues to educate customers, discovering and resolving environmentally based health threats, providing health services, including preventive care and problem intervention, and improving the means and methods for maintaining the health of the beneficiary population, by constantly evaluating the performance of the healthcare services system. *DODD 6200.4, October 9, 2004*

Preventive Medicine. Anticipating, predicting, identifying, preventing, and controlling illnesses, injuries, communicable diseases (including vector-, food- and water-borne diseases), and diseases due to exposure to occupational and environmental health hazards. It includes disciplines such as epidemiology, clinical preventive medicine, occupational medicine, industrial hygiene, environmental health sciences and engineering, medical entomology, health promotion and wellness, community and public health, mental health, toxicology and laboratory support sciences (environmental, occupational, and radiological chemistry and microbiology), and risk communication.

DODD 6200.4, October 9, 2004

Operational Readiness. The capability of a unit/formation, ship, weapon system, or equipment to perform the missions or functions for which it is organized or designed. May be used in a general sense or to express a level or degree of readiness. Also called OR. See also combat readiness. (DOD, 2006a)

Readiness. The ability of US military forces to fight and meet the demands of the national military strategy. Readiness is the synthesis of two distinct but interrelated levels. a. unit readiness--The ability to provide capabilities required by the combatant commanders to execute their assigned missions. This is derived from the ability of each unit to deliver the outputs for which it was designed. b. joint readiness--The combatant commander's ability to integrate and synchronize ready combat and support forces to execute his or her assigned missions. See also military capability; national military strategy. (DOD, 2006a)

Readiness Condition. See operational readiness.

Readiness Planning. Operation planning required for peacetime operations. Its objective is the maintenance of high states of readiness and the deterrence of potential enemies. It includes

planning activities that influence day-to-day operations and the peacetime posture of forces. As such, its focus is on general capabilities and readiness rather than the specifics of a particular crisis, either actual or potential. The assignment of geographic responsibilities to combatant commanders, establishment of readiness standards and levels, development of peacetime deployment patterns, coordination of reconnaissance and surveillance assets and capabilities, and planning of joint exercises are examples of readiness planning. No formal joint planning system exists for readiness planning such as exists for joint operation and execution planning. (DOD, 2006a).

Appendix B

Glossary of Acronyms

AAR	After Action Review
AFR	Armed Forces Repository
AHRQ	Agency for Healthcare Research and Quality
ASD(HA)	Assistant Secretary of Defense for Health Affairs
BRAC	Base Realignment and Closure
C4I	Command, Control, Communications, Computers, and Intelligence
CBRNE	Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives
DHP	Defense Health Program
DNA	Deoxyribonucleic Acid
DOD	Department of Defense
DODIG	Department of Defense Inspector General
DRG	Diagnostic Related Group
DTIC	Defense Technical Information Center
FEDRIP	Federal Research in Progress Database
FHP	Force Health Protection
HEDIS	Health Employer Data Information System
HIV	Human Immunodeficiency Virus
ICD	International Classification of Diseases
IMR	Individual Medical Readiness
JCAHO	Joint Commission on Accreditation of Healthcare Organizations
JCS	Joint Chiefs of Staff

MEDPROS	Medical Protection System
MHS	Military Health System
MOOTW	Military Operations Other Than War
MRR	Medical Readiness Review
MRT	Medical Readiness Training
MTF	Medical Treatment Facility
NATO	North Atlantic Treaty Organization
NBC	Nuclear, Biological, and Chemical
NCQA	National Committee on Quality Assurance
NTIS	National Technical Information Service
OMB	Office of Management and Budget
OOTW	Operations Other Than War
OSD	Office of the Secretary of Defense
OTSG	Office of the Surgeon General
QDR	Quadrennial Defense Review
R&D	Research and Development
RDTE	Research, Development, Testing, and Evaluation
RVU	Relative Value Unit
RWP	Relative Weighted Product
U.S. GAO	United States General Accounting Office
USD(P&R)	Under Secretary of Defense for Personnel and Readiness
VA	Veterans Affairs